

Contents—Aug. 1946

Volume XXVII

No. 8

ARCHIVES OF PHYSICAL MEDICINE

(Formerly Archives of Physical Therapy)

30 North Michigan Avenue, Chicago 2, Illinois

Original contributions, exchanges and books for review should be forwarded to the Editorial Office. All business matters including advertising should be handled through the Executive Office, 30 N. Michigan Ave., Chicago 2, Illinois. The statements in the manuscripts published in the ARCHIVES OF PHYSICAL MEDICINE are made solely on the responsibility of the author. The American Congress of Physical Medicine does not assume any responsibility for statements contained therein. Manuscripts accepted for publication in ARCHIVES OF PHYSICAL MEDICINE are for exclusive publication and may not be published elsewhere.

OFFICERS

American Congress of Physical Medicine

MILAND E. KNAPP, M.D.,
Minneapolis, President.
WALTER S. McCLELLAN, M.D.,
Saratoga Springs, N. Y.,
President-Elect.
H. WORLEY KENDELL, M.D.,
Rochester, Minn., First Vice-President.
O. LEONARD HUDDLESTON, M.D.,
Los Angeles, Second Vice-President.
EARL C. ELKINS, M.D.,
Rochester, Minn., Third Vice-President.
ARTHUR L. WATKINS, M.D.,
Boston, Fourth Vice-President.
ROBERT L. BENNETT, M.D.,
Warm Springs, Ga., Fifth Vice-President.
RICHARD KOVACS, M.D.,
New York, Secretary.
JOHN S. COULTER, M.D.,
Chicago, Treasurer.
WALTER J. ZEITER, M.D.,
Cleveland, Executive Director.
MARION G. SMITH, B.Sc.,
Chicago, Executive Secretary.

EXECUTIVE COUNCIL

Kristian G. Hansson, M.D., New York, *Chairman*.
Norman E. Titus, M.D., Jefferson Barracks, Mo., *Secretary*.
William Bierman, M.D., New York.
John S. Coulter, M.D., Chicago.
James C. Elsom, Madison, Wisconsin.
Frank H. Ewerhardt, M.D., St. Louis, Missouri.
Roy W. Fouts, M.D., Omaha, Nebraska.
John Severy Hibben, M.D., Pasadena, Calif.
Abraham R. Hollender, M.D., Chicago.
Disraeli Kobak, M.D., Chicago.
Frank H. Krusen, Rochester, Minnesota.
Fred B. Moor, M.D., Los Angeles.
Nathan H. Polmer, M.D., New Orleans.
William H. Schmidt, M.D., Philadelphia.
Frederick L. Wahrer, M.D., Marshalltown, Iowa.
Miland E. Knapp, M.D., Minneapolis, *Ex-Officio*.

EDITOR EMERITUS

DISRAELI KOBAK, M.D.,
Chicago.

Subscription — In the United States, its possessions, and Mexico, \$5.00 yearly; Canada, \$5.50; elsewhere, \$6.50 the year.

Advertising rates on application. All advertising copy subject to acceptance by publication committee.

Published monthly at Chicago, Illinois, by American Congress of Physical Medicine.

Entered as Second Class Matter, February 15, 1945, at the Post Office at Chicago, Illinois, under the Act of March 3, 1879.

ORIGINAL ARTICLES

Progress in Physical Medicine During the Past Twenty-Five Years. Richard Kovacs, M.D.	473
Medical Implications of Convalescence. Major Richard W. Lippman, M.C., A. U. S.	477
Physical Medicine as Recognized Specialty is Brought Out in Demonstrations at the A. M. A. Convention in San Francisco.	485
Electroshock Therapy with 200 Milliampères for Ten Seconds. Clarence W. Olsen, M.D., and L. C. Dale	488
Exhibit on Physical Medicine.	491
Rapid Rehabilitation Following Hand Injuries. Harold Lefkoe, M.D.	499
The Registry Examination. C. d'A. Gerken.	508
Editorials	513
Medical News	516
Book Reviews	518
Physical Medicine Abstracts	521

EDITOR OF THE MONTH

FRED B. MOOR, M.D.
Los Angeles, Calif.



EFFECTIVE APPLICATION OF HYDROMASSAGE

OFFICE . . . CLINIC . . . HOSPITAL

With the Rocke Hydrotherapy Bath

When hydrotherapy is indicated, the Rocke Bath provides impeller-agitation of whirling, aerated water . . . a vertical surging action, evenly distributed throughout the treatment tank.

Self-contained and mobile, the Rocke Bath is an efficient unit for administering effective hydromassage in office, clinic or hospital.

Detailed information, including specifications, may be obtained by clipping and mailing the handy coupon today. Address G-E X-Ray Corp., 175 W. Jackson Blvd., Chicago 4, Ill.

*Please send me complete information
about the Rocke Hydrotherapy Bath:*

Dr. _____

Address _____

City _____ State _____

GENERAL  ELECTRIC X-RAY CORPORATION

PROGRESS IN PHYSICAL MEDICINE DURING THE PAST TWENTY-FIVE YEARS *

RICHARD KOVÁCS, M.D.

NEW YORK, N. Y.

The story of the progress of physical medicine as part of the practice of medicine during the past twenty-five years is impressive. In the United States, up to the time of World War I, the few men practicing as "electrotherapists" were looked upon by many of their medical brethren with suspicion mingled with pity. Hydrotherapy, manipulation, and massage were mostly exploited by poorly educated technicians or adherents of cults. Generally speaking, there were no physical therapy departments in hospitals and medical schools, where the different physical methods could be correlated with each other and be a part of a general therapeutic regime, and where clinical and laboratory research could be carried on. This situation first changed for the better during and after World War I by the installation by the Army and Navy of broadly conceived physical therapy departments, in order to benefit the injured and disabled. In these departments all time-honored and many of the new methods of physical therapy were practiced under the watchful eyes of capable medical men. After the War, there became available a body of competent technicians and a number of physicians who continued the work in civilian practice. Groups of medical men and technicians organized for mutual cooperation and study; the medical profession at large showed much interest in physical therapy and its departments in civilian and reconstruction hospitals were gradually installed.

The New York Electrotherapeutic Society was organized on March 9, 1921 as an affiliated group of the American Electrotherapeutic Association which was founded in 1891 and centered chiefly in the East. Out in the Midwest, the American College of Physiotherapy was organized after starting in 1922 as a Physiotherapeutic Convention. It became in 1928 the American Congress of Physical Therapy. In 1932 the two large national organizations amalgamated. The organ of the Congress, the Archives of Physical Therapy, thus became the official publication of organized physical therapy in the United States, and is now the leading physical therapy periodical in the world. An Academy of Physiotherapy, founded by former medical officers in the first World War, centered chiefly around Boston. The New York Electrotherapeutic Society changed its name to that of "The New York Society of Physical Therapy" in 1933, affiliating with the Congress, and the only other active regional organization in Pennsylvania and on the Pacific Coast did likewise. The New York County Medical Society was the first county society to appoint a special committee on physical therapy in 1927; the Medical Society of the State of New York created a special committee two years later; this State Committee had as its special object to foster postgraduate instruction in all counties of the State. The American Medical Association created in 1927 a Council on Physical Therapy; this Council soon became a potent factor in disseminating nationwide, proper information on physical therapy, in advocating basic training in it and in curbing unwarranted claims and commercialization.

As a result of all these factors, in the years up to World War II, there was constant progress in education, research, in clinical application, and in the development of new methods in physical medicine.

* Read at the Twenty-Fifth Anniversary Meeting of the New York Society of Physical Medicine, March 16, 1946.

* Reprinted New York State J. Med. 46:1229 (June 1) 1946.

Development of New Methods

Perhaps the most spectacular progress in physical therapy methods during the past twenty-five years occurred in the field of high-frequency electricity. Although high-frequency heating of the human body was discovered by d'Arsonval away back in 1892 and introduced, chiefly by Nagelschmidt, under the name of diathermy in 1908 in the United States the first efficient multiple spark-gap apparatus was not produced until 1920; in the intervening period the principles of electrosurgical destruction were also developed by de Keating Heart, and Doyen in France, and Cook and William L. Clark in the United States. After World War I the medical profession here was flooded first with spark-gap apparatus, and in another decade with "short-wave" tube apparatus, so much so that after a while no self-respecting physician's office seemed to be able to exist without one of these machines. When at the outbreak of World War II, steps were taken to take a census of diathermy apparatus, first for purpose of national safety, and later, for the diminution of radio-interference, it was found that some 2,200 hospitals and over 50,000 physicians—one out of four of every physician in the U.S.A.—possessed such an apparatus. It is evident that in the hands of the majority these machines amounted to little more than that of a glorified heating pad.

It is the present consensus that the clinical effects of both long-wave and short-wave diathermy when properly applied are deep tissue heating, and their chief value lies in treatment of chronic inflammatory and traumatic conditions of organs of the chest, abdomen, pelvis, and of bones and joints. After much deliberation, the Federal Communications Commission last year assigned three definite wavelengths (22, 11, and 7.32 meters) for the use of diathermy apparatus so that a minimum of radio interference is caused to other services.

Artificial fever treatment by diathermy, and by other methods of general body heating came to the fore some fifteen years ago. Much of the pathfinding studies of its physical and physiologic effects were made in New York State by Bierman, Carpenter, Warren, and Whitney. The first International Conference on Fever Therapy was held in New York City in 1937. Today the newer developments of chemotherapy have to a great extent superseded fever treatment of gonorrheal infections, but fever therapy has remained a standard form of therapeutics in a number of well-defined conditions.

Other methods of electrotherapy have undergone a variegated course in the past two decades. Static electricity had a temporary upsurge after World War I and then went into a steady decline, chiefly because of bulky apparatus, radio interference, and other measures compensating for the undoubtedly useful effects of static electricity. Galvanism was at a low ebb at the beginning of this cycle, but since then has commanded a constant increase in interest, chiefly by utilization of ion-transfer. Much painstaking experimental and clinical work was done with ion-transfer of vasodilating drugs, mecholyl, and histamine; their application now plays an important role in the treatment of traumatic and rheumatic-conditions and of vascular spasm.

Low-frequency apparatus has undergone a gradual cycle of evolution from the original, simple galvanic faradic outfit to bulky and complicated motor generators and now, to more simple and efficient electronic generators. The often-doubted clinical value of electrical muscle stimulation in flaccid paralysis has been definitely reaffirmed by extensive experimental work of recent years. At the same time considerable progress has been made in other methods of electrodiagnosis, including electromyography.

The method of inducing convulsions by means of an alternating current applied to the brain came about as an evolution from the more hazardous drug administration for shock therapy in mental disorders; it repeats the similar transition from drug therapy to physical therapy for physically induced fever. Electric shock therapy has proved especially applicable to the early stages of depressive mental conditions.

The employment of artificial ultraviolet irradiation has assumed much importance since Hulschinsky in 1919 reported its curative effect on rickets. The controlled studies of Hess of New York, first published in 1924, that oils and fats could be made antirachitic by ultraviolet rays mark also the beginning of modern vitamin therapy. Air sterilization of operating rooms and for preventing cross infection in wards by generators emitting the predominantly bactericidal band of 2,537 Angstroms promises further interesting developments. On the other hand, the earlier enthusiasm toward the employment of ultraviolet transmitting window glass has gradually faded out.

Hypothermy, or the therapeutic use of cold, has been greatly stimulated by clinical research in recent years. The original claims for some specific action in inoperable malignancies have been abandoned, but on the other hand, the scope of employment in military and industrial surgery and in peripheral vascular diseases are expanding. For amputation of gangrenous extremities, the technic developed by Allen and Crossman has proved to be efficient.

Hydrogymnastics or the carrying out of exercises and manipulation in therapeutic pools and tanks, together with the earlier employment of the whirlpool bath, or hydromassage, has brought hydrotherapy into more extensive use. Originally introduced for the redevelopment of muscles weakened by infantile paralysis and unable to work against gravity outside of the water, pool or tank exercises has been found useful in treatment of the sequelae of many traumatic conditions, of hemiplegia, and chronic arthritis.

Spa-therapy in the United States has undergone gradual decline for many years. Members of the American Congress of Physical Therapy made a survey of the spa situation a few years ago and subsequently, the American Medical Association appointed a Committee on Health Resorts, in order to study and to promote spa-therapy. This subject has now been brought into the foreground of interest by the fact that the Army, Navy, and Veterans Administration took over a number of resorts for active utilization in rehabilitation. It is to be hoped that under the impetus of these developments an era of a more general and more intelligent use of our health resorts will arise, instead of their misuse by the idle rich as society playgrounds or by commercial exploitation for much valueless treatment.

The institution of a nation-wide program for rehabilitation of those disabled by war and war-connected industrial activity has brought about widespread attention to the importance of exercise and physical fitness. Instead of much of the cumbersome passive therapy apparatus of former years, the present tendency is to use early active exercise without any apparatus, and later, either active exercise apparatus of simple construction or various devices of the curative workshop principle, aiming to restore function as well as the individual's habit of work. All this leads to an increasing tendency to combine physical therapy with occupational therapy under competent medical direction.

Physical Therapy Technicians

Technical help is indispensable for institutional work and in busy physicians' offices to carry on physical therapy. The training and qualifications of technicians during the development period of physical medicine in the

United States was in a somewhat chaotic condition, varying from those with a background of nursing or physical education, or those with a college background trained in a few high-class physical therapy schools, to graduates of massage schools or other commercial establishments. The American Medical Association in 1934 established a program of standardization of schools for physical therapy technicians by cooperation of the Council on Medical Education and Hospitals and the Council on Physical Therapy. In conjunction with the standardization of schools, the American Congress of Physical Therapy established the American Registry of Physical Therapy Technicians. Only those with acceptable training are allowed to take examinations for membership in the Registry. According to 1945 figures, there was a total of 3,967 physical therapy technicians in hospital service and there were over 3,000 members in the Registry. In spite of the nation-wide high standard thus established, local and state politics still cause considerable confusion. New York City furnishes the most glaring example, with no less than four sets of standards: (1) the national; (2) a state law empowering "registered" physiotherapists to keep offices of their own, practicing nominally under a physician's supervision; the majority of this group of over 400 was licensed under a waiver clause, without passing any examination; (3) massage technicians licensed by New York City; (4) technicians employed in city hospitals under Civil Service requirements. The recent adoption by the Army of the term "physical therapist" to denote technicians is another source of nation-wide confusion in differentiating between physicians and technicians.

Instruction and Research

Undergraduate and postgraduate instruction in physical medicine, and clinical and laboratory research showed a steady increase in the past two decades. However, an accelerated progress became dramatically inaugurated two years ago by the establishment of the Baruch Committee on Physical Medicine and by large grants for research in physical therapy made by the National Foundation for Infantile Paralysis and the National Council of Research. The original recommendations of the Baruch Committee, the establishment of teaching and research centers, establishment of fellowships and residencies, and promotion of teaching and research in physical medicine in all approved medical schools are being fully carried out and reports on the results of this work of large scope are beginning to come in. Among the most promising and most fascinating results of this activity is the establishment of a center for special training in physics and engineering and of a laboratory of applied biophysics at the Massachusetts Institute of Technology. The inauguration of so much research and the entry of many newly trained, enthusiastic minds into the field of physical medicine should bring forth many desirable new developments in experimental results and clinical application, in addition to the less heralded and less subsidized patient research work being steadily carried out by individuals and some institutions.

Recent Developments

A number of significant developments in the status of physical therapy have taken place in the last few years or are about to be consummated. One of the most important ones was the adoption of the term Physical Medicine by the American Medical Association in 1944 to replace the term of physical therapy. Under this definition physical medicine includes the employment of the physical and other effective properties of light, heat, cold, water, electricity, massage, manipulation, exercise, and mechanical devices for physical and occupational therapy in the diagnosis and treatment of disease. The new term is much more comprehensive and adds dignity to this department

of medicine. In accordance with this change, the names of all organizations and publications pertaining to physical medicine have been changed. Physicians specializing in physical medicine have long felt the need for a more distinctive and simple term to describe them as practitioners of physical medicine. A special committee appointed by the Society of Physical Medicine has studied this question and found the term "physiatrist" etymologically the more correct for this purpose. The Council of Physical Medicine recently voted to adopt this term and has recommended its promulgation by The Journal of the American Medical Association. An even more important development is the very recent consideration of the Advisory Board of Medical Specialties that a board on physical medicine be established as a conjoint board of a major specialty and thus, physical medicine be officially recognized as a specialty. On the more practical side of newer developments the rejuvenated veterans' services have also recognized physical medicine for the first time and attendings and consultants on physical medicine are being now appointed nation-wide. All present rehabilitation and reconditioning regimens are planned and executed with physical medicine as the cornerstone of the work. This fact will, in turn, unquestionably have profound effects on the future scope and methods of physical medicine in civilian hospitals.

In summing up, it can be safely asserted, that after twenty-five years of constant progress, and in spite of many handicaps, physical medicine has at least come to a turning point where its value as part of a modern medical regimen is fully recognized and where the prospects for its further development both as a science and as an art are most encouraging.

MEDICAL IMPLICATIONS OF CONVALESCENCE *

MAJOR RICHARD W. LIPPMAN

Medical Corps, Army of the United States

From an economic or social standpoint, convalescence may be said to constitute the most important phase of disease. At any rate, it certainly constitutes the greatest percentage of time lost from productive social activities due to illness. For purposes of this discussion, of course, I am assuming that "convalescence" refers to the period of gradual recovery of full function following control or arrest of a disease process or injury.

In surgical conditions one can see this attitude verified by considering the ordinary acute surgical case. For example, the patient with appendicitis is acutely ill during a period of, say, twelve to forty-eight hours prior to operation. He is operated on, the diseased part is removed, and for the succeeding fourteen to twenty-eight days, he is convalescent. A similar situation obtains in virtually all surgical conditions as soon as definitive treatment has been completed.

In a medical case the situation is entirely comparable. For example, a patient with pneumonia in these days of modern chemotherapeutic agents may be acutely ill for a period of twenty-four to seventy-two hours. By the end of that period, in most cases, sulfonamide or penicillin therapy has con-

* From the Reconditioning Service, Bushnell General Hospital, Brigham City, Utah. Photographs by Technical Sergeant Walter H. Richardson.

trolled the disease condition, and for the next period, which may extend from one to three weeks, that patient is likewise convalescent.

There are many types of cases in which the importance of convalescence is much more obvious and has been more generally recognized. I mention, in passing, tuberculosis. In this disease the management of convalescence has been recognized for many years as being of prime importance, not only to the patient but to the community as a whole. It is only recently, however, that recognition of convalescence as an important factor in recovery from virtually all diseases which terminate favorably has attracted general attention.

In the past, it has been customary for the period of convalescence virtually to be wasted, for both the patient and his social environment. It has been a time when relatives bring flowers, diverting books and games. During late or prolonged convalescence, for economically able patients, it has been a period for recreational trips to resort places and spas. It has been a period which was trying to the patient because he was limited in his capacity to perform and he was not provided with an understanding of his limitation or a constructive means of utilizing this time.

This situation, which involves an enormous waste in terms of time which could be made useful to the patient and to the country, must be considered a responsibility of the medical profession. There has always been a tendency for the physician to lose sight of the patient as an integrated entity. This tendency is a natural one and has increased with subdivision of the specialties, as the doctor knows "more and more about less and less." Every physician has spoken of the patient as "a hemorrhoid," or "a gall-bladder" or "a pneumonia" in discussion with other physicians. It is probably inevitable for the specialist who becomes more and more concerned with a smaller and smaller area of the patient. Yet what a distorted idea of the patient it reflects.

A much more constructive approach can be taken toward convalescence. The convalescent period can be made a period of education, of adaptation, of further improving the patient's relation to his milieu through judicious application of psychologic and physical exercises. The period of convalescence can actually be shortened to a considerable degree.

The Physician's Responsibility

The physician's responsibility must not cease with the diagnosis and treatment of a disease process or injury. When a man becomes a physician he assumes a greater responsibility to the individual and to the society in which he practices. The recognition of this principle has grown as the science of medicine has grown. In the case of infectious disease, the physician readily recognizes that he not only must diagnose and treat the disease but must report it to the health department. He bears a responsibility for explaining the significance of these measures to the family, and in this respect he is an agent of health education. In recent times the physician has become an agent of preventive medicine through routine physical examinations, through the dissemination of information and through his influence upon his patients, inculcating in them principles of healthful living. It is equally important that the physician recognizes his obligation to the patient in the management of convalescence. His concern for the patient should start with the beginning of disability and should not end until the disability is removed and the patient has returned to a full, normal function. Failure to consider the patient as a whole is particularly important in dealing with diseases or injuries which may be limited in spatial extent but will result in a permanent handicap. In the case of an amputee, for example, who has lost a limb in

consequence of trauma, the greater part of his anatomy is still intact. The same can be said of his mental functions, except that he must face the necessity of readjustment to a handicapped life. If consideration in his treatment revolves around the injured part to the exclusion of his intact functions, not only will he fail to make the best use of his convalescence in adjusting to his new situation but he will begin to lose those physical and mental skills which he possessed before incurring his disability.

Adaptation of the Handicapped

The injured and the ill with prospective permanent handicaps face tremendous problems in adaptation. These problems vary from such actual physical adaptation as the development of new muscles and coordination with which to control a prosthetic device to much more complex situations. The patient is confronted with a psychologic adaptation to his illness and especially to his permanent handicap, if one will remain. The amputee, for example, must adapt his psychology to a diminished "ego boundary"—his external shape is different from that of the average man. He is confronted with social adaptations relating to the limitations which his handicap will impose upon him in the exercise of his social and occupational activities. These social adaptations, in the case of deformity, involve his relations with other people and their reactions to his deformity and his disabilities.

An example of the social adaptation necessary can be easily found by examining the situation of an arm amputee. The arm amputee may be



Fig. 1. — Arm amputee learning use of prosthesis in occupational therapy department, Bushnell General Hospital.

furnished with a variety of prosthetic devices, varying from the so-called cosmetic hand, which is a true reproduction in appearance of the hand he has lost but which has no functional value, to the various types of hook which, though somewhat bizarre on first appearance, have a great deal of practical value to the patient. In handling hundreds of hand amputees it

has been my experience that amputees invariably prefer to wear the cosmetic hand with a glove over it. This tendency is so great that it was necessary at our hospital to require them to wear the hook at all times until their training in its use was completed. They all felt that the hook rendered them more obvious in company and that it aroused an unfavorable reaction from those people whom they met. Of course, they forgot that the cosmetic hand in itself is a stiff and unnatural-appearing object which arouses attention to almost the same degree. Upon leaving the hospital they almost all immediately return to the use of the cosmetic hand, and, after a period of readjustment during which they realize that the hand presents very few advantages in appearance and is of no practical use, they return willingly to the hook. They find that the hook is accepted readily by those people who have seen it a few times and that it enables them to perform all ordinary operations in their daily living, thus removing their dependence upon other people.

A similar adaptation to their deformity must be made by leg amputees. When our program first started, the leg amputees were very reluctant to appear in public situations where their deformity showed. This was particularly noticeable in swimming activities where they wanted to be assured

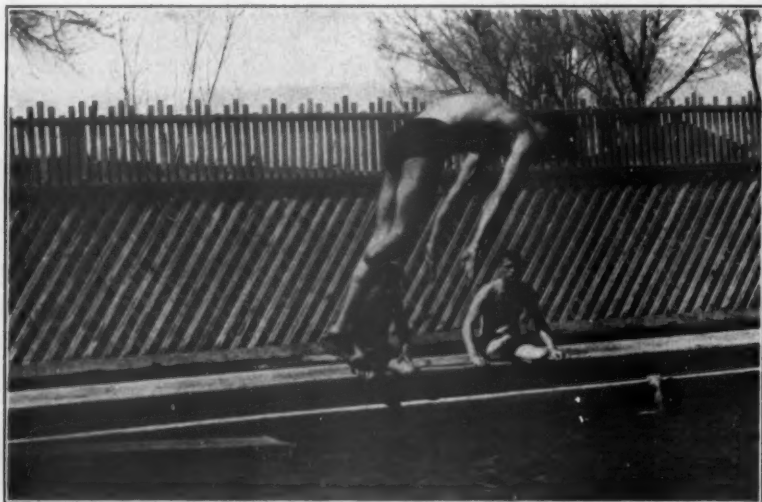


Fig. 2. — Amputee swimming class, Bushnell General Hospital.

of a reserved time when no other people would be there to observe them without clothes covering their deformity. Gradually this prejudice has been broken down until now at our hospital the leg amputees participate in swimming with all other patients and personnel, including girls, and have lost a considerable part of the self-consciousness that they originally felt. These adaptations are essential if the patient is to lead a happy and well adjusted life upon release from the sheltered environment of the hospital.

Physical adaptations can be exemplified by the situation of many patients with transverse myelitis whom we have observed here. Many of these men arrived at the hospital in relatively poor condition, having received their injury weeks to months prior to admission here. Many of them had decubitus ulcers and showed considerable wasting of their upper extremities and thoracic framework due to inactivity while at complete bed rest. In the case of all men who were not acutely ill from secondary urinary infections or other complications, an intensive physical reconditioning program was instituted with the objective of building up the upper extremities and the

shoulder girdle to the point where weight could be supported on crutches. The same objective of developing every possible potentiality was applied to whatever muscle action remained in the lower part of the body. It became a frequent occurrence to see a man who had arrived helpless in bed, unable to support himself, improve to the point where he was able to be out of bed on crutches or in a wheel chair as a result of the improvement in his muscular development. This, in turn, has a tremendous psychologic effect upon the man as he recognizes his own improvement and his feeling of hopelessness is dispelled. Educational training and evaluation of his potentialities likewise improve his attitude as he realizes that it may not be necessary for him to remain a permanent dependent of others. And the other patients in the wards seeing one man improve, are filled with hope for themselves, and so a radiation of the good effect is obtained throughout the whole ward.

Disuse Atrophy

Equally important with the positive adaptations which should be made during convalescence is the prevention of regression in skills, abilities and physical status. The basis for this concept is the physiologic phenomenon of disuse atrophy, which may be evident in both physical and emotional spheres.

A normal, healthy person if confined to bed for a protracted period becomes markedly asthenic, with diminished muscle tonus. This is evidenced by his inability to stand or walk without assistance at the start, although the time necessary to overcome his weakness varies in accordance with his initial status and the degree to which disuse atrophy had progressed. In addition to muscular atrophy, regressive changes produce vasomotor instability, evidenced by a feeling of warmth or chill, easy sweating and the other common signs of this condition. Emotional and intellectual atrophy is also noted both in the obvious loss of facility for complex skills and in the less obvious change in emotional tonus that occurs in a person restricted to bed. Every one realizes how easy it becomes for the person who is confined to bed to relax and doze most of the day and, in most cases, to show a considerable reduction in initiative and ambition.¹

These subtle mental changes that accompany prolonged hospitalization or prolonged confinement to bed have been recognized in a backhanded way by the medical vernacular with the term "hospitalized." The "hospitalized" patient is one who as a result of prolonged bed rest or restricted activity has incurred certain definite mental changes, including querulousness, excessive demands of attention, a whining behavior and the lack of initiative mentioned. While a person's behavior in a situation is an expression of the efficacy of his personal adjustment, the emotional stress provided by a restricted environment and an indefinite prognosis may exceed his potentiality to make a favorable adjustment, which may not ordinarily be threatened.

The changes that have been mentioned following prolonged restriction of activity are real, and many of them may have a definite physiologic basis. The effects of atrophy upon muscle which is not used is well known: reduction in size of the fiber, reduction in the number of fibers, etc. Recently some evidence has been found that excessive rest may affect more complex metabolic functions. Thomas and Harrison² produced experimental myocardial infarction in rats and noted that delayed healing was correlated with excessive restriction of activity. Blotner³ found that prolonged physical inactivity reduces the tolerance for sugar in nondiabetic subjects.

1. Menninger, K. A.: The Abuse of Rest in Psychiatry, *J. A. M. A.* 125:1087 (Aug. 19) 1944.

2. Thomas, W. C., and Harrison, T. R.: Effect of Artificial Restriction of Activity on Recovery of Rats From Experimental Myocardial Injury, *Am. J. M. Sc.* 208:436 (Oct.) 1944.

3. Blotner, H.: Effect of Prolonged Physical Inactivity on Tolerance of Sugar, *Arch. Int. Med.* 75:39 (Jan.) 1945.

Effects of Rest

In the past there were certain doctrines concerning rest which were more or less arbitrarily assumed, passed on through medical tradition, never questioned and never proved. Not very long ago it was the usual procedure for patients to remain in bed for two to three weeks following an abdominal operation or for two weeks following delivery. The principle of keeping a patient with coronary occlusion in bed for four to six weeks is still accepted by most physicians as a preferred procedure. Most orthodox opinion in the management of tuberculosis requires that patients with minimal lesions be kept on absolute bed rest for a period of approximately one year.

This general idea of the virtues which rest affords seemed obviously correct. Patients who were in bed for several weeks following an abdominal operation or women who had given birth and remained in bed for two weeks were very weak upon arising. It seemed obvious to think that if they were so weak after a prolonged period of rest, they would have been so much weaker had they not rested. Only in the last few years, particularly in the last five years, since the beginning of the war, has medical thought begun to veer from this direction. Some brave surgeons advocated early rising after major operative procedures if they were uncomplicated. I remember a lecture in 1938 in which Dr. Wayne Babcock, Temple University, mentioned the use of metallic suture material and having a patient out of bed on the third postoperative day after an uncomplicated appendectomy. This statement, at that time, caused a sensation in the minds of his listeners. It was a radical departure.

The movement towards reevaluation of rest was accelerated by the war years, when hospital beds and medical care were at a premium. Necessity forced hospitals to discharge postpartum patients sooner than had been the custom because the emergency required it. Soon obstetricians began to find that early rising did not appear to harm the patients. In fact, thrombotic manifestations and other complications due to hypostasis appeared to be diminished.⁴ Rosenblum and associates, in a considerable series of cases, found rising on the first day to be beneficial and to produce no harmful effects⁵

Other authors began to question the value of prolonged and enforced rest in cardiac conditions. Tinsley Harrison has doubted the value of absolute bed rest in cases of coronary occlusion beyond two weeks after subsidence of acute symptoms.⁶ Levine has observed that in certain circumstances enforced recumbency may actually increase the load on the heart during cardiac failure.⁷

Even in tuberculosis, in which the value of rest has been most unquestioned, some contrary findings have been reported. M. I. Levine, observing children with primary tuberculosis, found that unrestricted activity had no effect on ultimate prognosis.⁸

There is an increasing body of surgical opinion which advocates early rising in uncomplicated cases, even after major surgical procedures.⁹ Nel-

4. Rotstein, M. L.: Getting Patients Out of Bed Early in the Puerperium, *J. A. M. A.* 125:838 (July 22) 1944.

5. Rosenblum, G.; Melnikoff, E., and Fist, H. S.: Early Rising in the Puerperium, *J. A. M. A.* 129:849 (Nov. 24) 1945.

6. Harrison, T. R.: Abuse of Rest as a Therapeutic Measure for Patients with Cardiovascular Disease, *J. A. M. A.* 125:1075 (Aug. 19) 1944.

7. Levine, S. A.: Some Harmful Effects of Recumbency in Treatment of Heart Disease, *J. A. M. A.* 126:80 (Sept. 9) 1944.

8. Levine, M. I.: Primary Tuberculosis: Effect of Unrestricted Activity on Prognosis, *Am. J. Dis. Child.* 68:385 (Dec.) 1944.

9. Powers, J. H.: The Abuse of Rest as a Therapeutic Measure in Surgery, *J. A. M. A.* 125:1079 (Aug. 19) 1944.

son reported on a series of 426 cases in which wire or cotton sutures were used and after in which uncomplicated major abdominal operative procedures, the patients were encouraged to rise immediately after recovery from anesthesia.¹⁰ No ill effects were noted: there was no increase of wound disruption, and postoperative complications were reduced. In a similar series of more than 1,000 cases Marescot¹¹ reported equally good results.

Certainly these factors are to be considered in approaching the question of bed rest. A prolonged stay in bed is associated with: (1) pulmonary hypostasis; (2) venous hypostasis with thrombosis and embolization; (3) gastrointestinal atony with constipation and distention; (4) bladder atony, with difficulty in urination; (5) general asthenia, and (6) depressed mental tone.

There may also be delayed healing, as indicated by Thomas and Harrison,¹ presumably as a result of less active circulatory supply.

Surgeons have considered these factors and have combated them by various measures. Deep breathing and movement in bed have been used for several years by progressive surgeons. Medications have been used to

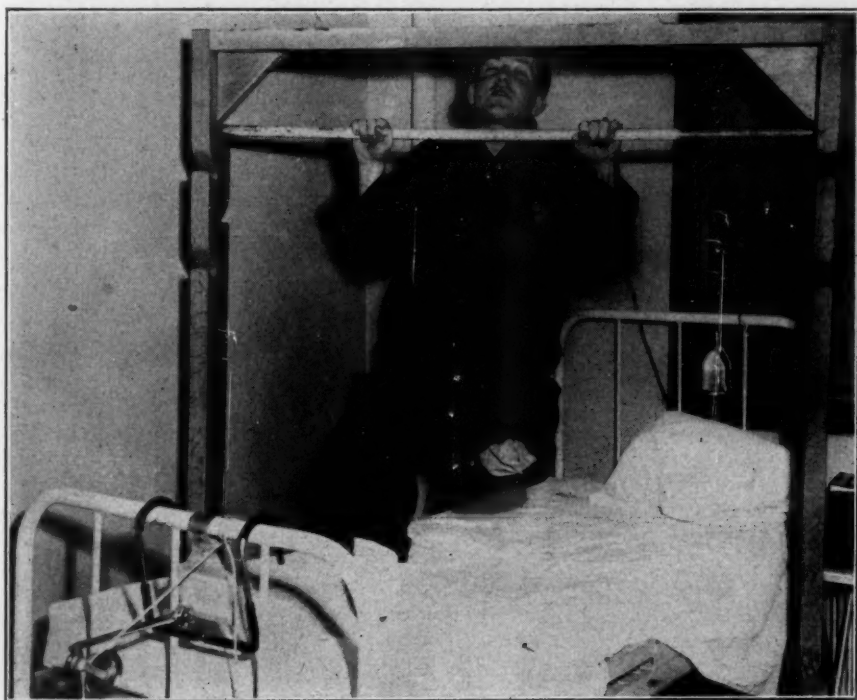


Fig. 3. — Amputee exercises in bed on horizontal bar, Bushnell General Hospital.

increase tonus of smooth muscle. Now one wonders whether reconsideration of the significance of rest may not lead to a more physiologic method of maintaining tonus.¹²

Another side of this consideration is presented by the reduction in time during which bed facilities are occupied by the patient. Early rising, with shortened convalescence resulting, may result in considerable economic gain

10. Nelson, H.: Early Ambulation Following Anterior Section of Abdominal Wall, *Arch. Surg.* 49: 1 (July) 1944.

11. Marescot, E.: Early Rising and Pulmonary Embolism After Abdominal Operations, *Med. Espan.* 7:284 (March) 1944.

12. Ghormley, R. K.: The Abuse of Rest in Bed in Orthopedic Surgery, *J. A. M. A.* 125:1085 (Aug. 19) 1944. Dock, W.: The Evil Sequelae of Complete Bed Rest, *ibid.* 125:1083 (Aug. 19) 1944. Newburger, B.: Early Postoperative Walking, *Surgery* 14:142 (July) 1943.

to the patient and to the community, as well as more efficient utilization of hospital facilities.

Intellectual Opportunities

The period of convalescence offers a wonderful constructive opportunity for the patient. He is looking for means of occupying his time. He needs guidance in achieving the mental adaptations previously mentioned. One problem uppermost in the minds of every one recuperating from a chronic or disabling condition is that of future job opportunities and economic status.

Vocational counselling procedures should be available in all hospitals dealing with convalescent patients with expected permanent residua. Such procedures should include testing materials for aptitude and interest, such as the Kuder Preference Record.

In addition, there is a wide variety of educational procedures which can be afforded the convalescent. These may range from self-study courses



Fig. 4. — Art class drawing from living model, Bushnell General Hospital.

to organized classes in high school or college subjects in a larger institution. There is a definite need in civilian hospitals for access to educational materials of the type provided by USAFI — The United States Armed Forces Institute — for military installations. Prevocational shops may afford increased educational and exploratory opportunities at centers large enough to support such facilities.

Although emphasis has been placed upon the institutional patient in this discussion, equal importance is attached to the needs of patients convalescing at home.

Reconditioning

A start has been made along the lines of management of convalescence by the Reconditioning Program initiated by the Surgeon General over two and one-half years ago. A description will not be attempted at this time, but one can be obtained by reference to appropriate Army manuals. I have outlined the program briefly¹³ in an article to be published.

13. Lippman, R.: Reconditioning: The Management of Convalescence, New York State J. Med., to be published.

The important thought is this: There are many ways to improve the medical management of convalescence. The Army's Reconditioning Program has shown that such improvements can be accomplished by an organized, systematic approach. Physicians who have been associated with a well organized and functioning Reconditioning Service can bear testimony to shortened convalescence and improved adaptations made by patients. Although it is usually difficult to measure the effects of such a program, they are nonetheless definite.

The lessons learned during the past bitter war, lessons learned at great cost and through trial and error, should be preserved and extended to civilian medical practice. This will be done only if physicians become aware of the medical implications of convalescence, their social corollaries, and accept their growing responsibility.

Summary

1. Stress has been placed upon the medical and social implications of convalescence.

2. The physician's responsibility in the management of convalescence has been outlined.

3. The significance of disuse atrophy to the integrated organism and the physiologic abuses of rest have been discussed.

4. Suggestions are made concerning the constructive intellectual uses of convalescent time.

5. Attention is directed to the success of the Army's Reconditioning Program, which has shown that considerable improvements in convalescent care may be made through a conscientious and well organized approach.

PHYSICAL MEDICINE AS RECOGNIZED SPECIALTY IS BROUGHT OUT IN DEMONSTRATIONS AT THE AMA CONVENTION IN SAN FRANCISCO *

Although the first post-war meeting of the American Medical Association was the ninety-fifth convention, this year for the first time it featured an exhibit on rehabilitation and physical medicine. Wartime advances in physical medicine were evident not only in the exhibit, but in the interest shown by the 10,000 specialists and practitioners who attended the gathering.

Early in World War II, a leading orthopedist predicted that "the last war established orthopedics as a recognized specialty; this war may well do the same for physical medicine." It would seem from the interest demonstrated that his prediction was true.

As was pointed out in the booth on "Technology and Medicine," fiction has given many people a distorted understanding of medical research. Some see the physician standing at the bedside faced by a problem. Suddenly an idea comes to him. He rushes back to his office to make some experiments, preferably upon himself, and comes up with a miraculous discovery.

Research Is Painstaking

Medical research, unfortunately, does not follow such a pattern. It is usually slow, painstaking, unspectacular research in which many pieces

* Howard Rusk, M.D., *New York Times*.

of a jig-saw are fitted together, studied, tried and then refitted until finally a new technic is developed, tested and proved. This is true in physical medicine, which is as its name implies, the employment of the properties of energy and motion for diagnosis and treatment.

The utilization of the science of physics therapeutically has been minimal in the past as compared with the use of the science of chemistry. This is largely due to the fact that physical medicine is usually non-specific in action; it helps the patient recover, but is most often an adjunctive rather than a primary agent.

Features of the military services' exhibits were the Army's demonstrations on reconditioning in chest disease and heavy resistance exercise therapy, and the Navy's demonstration on rehabilitation of amputees. Army demonstrators said that bad posture, crooked spines, tilted heads and drooped shoulders need not occur after extensive operations in the chest. Recent advances in military hospitals in special therapeutic exercises given both before and after operations prevent such deformities.

In the heavy resistance exercise therapy the principle was shown that continued repetition of an exercise builds endurance but that strength can be increased only by performing an exercise under stress. Thus, if a person performs a series of exercises using wands, weights, dumbbells, or barbells of the same weight each day, muscle strength cannot be increased as rapidly as if the weight of the object causing the stress is increased daily.

In working with patients, the demonstrators warned that increased resistance each day must be just beyond the threshold of the patient's physical tolerance. If the graduation to increase resistance comes too rapidly, not only will the benefits of the exercise be lost, but actual harm may be done.

One of the demonstrators was T/Sgt. Walter Easky, a ski-trooper who fell on a jump and twisted his knee so badly that he had to wear a brace. After five months of wearing the brace, he started on the power building exercises and in two weeks the muscles were strengthened enough to give him all the support that the brace gave him. Easky's muscle power in the injured leg increased from twenty to eighty pounds. He was discharged back to duty, is still in the service and has had no further difficulty.

Amputees Demonstrate

Ten bilateral amputees from a near-by naval hospital gave demonstrations of all types of artificial legs, showing walking technics, gaits and methods of gaining maximum efficiency from their prostheses. Clad in blue and white uniforms, they also showed visiting doctors the types of occupational therapy and pre-vocational training given in Navy hospitals. Outstanding in this demonstration was the spirit of the men participating.

One of the most dramatic demonstrations was that of the medical rehabilitation division of the Veterans Administration on rehabilitation of patients with paralysis of the lower extremities resulting from spinal cord injuries.

Seven paralyzed veterans from Birmingham Hospital, one of the VA's six specialized centers for care of spinal cord injury cases, gave a complete demonstration of rehabilitation care from the bed to vocational training.

In hospital beds, the veterans, who have lost the power of movement and of feeling from the point of their injuries down, are given a simple muscle test to determine the extent of the paralysis and the strength of remaining muscle groups. They are then given another series of tests on the factors inherent in daily living.

Using a new treatment booklet entitled "What's Your Score?" which has the activities necessary in daily life that the patient must relearn be-

cause of his disability, the patient starts by learning to change his position in bed. Simple as this may sound, it is difficult, for the lower half of the man's body is in reality dead weight.

Using an inverted cane, the patient hooks the crook of the cane under the arch of one foot, pulling upward and inward until one leg is lying over the other. Then by turning the upper half of his body, the weight of the upper torso and the one leg will pull over the remainder of the body. This is an essential procedure, for if the patient lies in one position over a few hours, pressure sores may result.

The method of doing these activities and the other seventy-two in the booklet are explained with diagrams and cartoons. During his training period the patient is clocked each time and the time is recorded on an accompanying chart under the heading "My Own Score," in order that the time involved may be reduced to the minimum.

As the training proceeds, the activities become more complex, ranging from putting on clothes, controlling footrests of the wheel chair, and moving from wheel chair to bath tub and back, to walking with the aid of crutches and braces. Walking itself is broken down into the necessary skills for complete independence and mobility such as walking up and down a ramp, going up and down stairs, curbs and bus stops, getting up and down from the floor, carrying a valise and crossing a street within the time allowed by the traffic lights.

Methods Are Explained

The demonstrations were carried on in an informal manner, with top VA physicians and consultants explaining to physicians the methods used. Physicians talked freely with the veterans as the latter showed application and removal of the complicated braces worn by paraplegics, and the various types of crutch gaits.

In a near-by room a special film on rehabilitation of spinal cord injuries was shown at intervals along with other films dealing with physical medicine and rehabilitation.

Particularly interesting was the demonstration of the teaching of watch repair. T/Sgt. Lloyd C. Martin from Joplin, Mo., a former member of the 91st Bombardment Group, who broke his back in a crash in England in 1942, was busy at his bench bending hairsprings, refitting delicate jewels and making other watch repairs. He is one of the many veterans taking courses in watch repair at Birmingham Hospital offered by the VA in co-operation with the Bulova Watch Company.

Martin, who said he formerly "tinkered" with watches but had had no training in watch repair has been receiving instructions for one month. When he is discharged from the hospital he will be able to come to the school Bulova has in New York for disabled veterans or will be able to enroll in an apprenticeship or on-the-job training under the VA's vocational rehabilitation program. Rather than wait to start his training after he has completed his hospital stay, he expects to have nearly half of the time of his training course because of the instruction he received in the hospital.

Similar courses in watch repair, radio repair and other vocations particularly suited to the physical limitations of paralyzed veterans are being started in the other VA paraplegic centers.

As the goal of all rehabilitation is employment in useful and gainful work for the disabled individual, one section of the exhibit was devoted to the vocational placement of handicapped workers. Graphs, charts and booklets showed the important part played by the handicapped during the war

manpower shortage and pointed out the need for increased knowledge by physicians on selective placement technics of matching the physical capacities of the individual with the physical demands of the job.

Exhibit Shows Aid

Translating the experience of the military services and the Veterans Administration into its applications for the thousands of disabled civilians was a booth of the Baruch Committee on Physical Medicine. Displays showed that the greatest need in rehabilitation right now is facilities, where disabled civilians may receive treatment and rehabilitation of the type afforded disabled servicemen by the military services and the VA.

Copies of the committee's recently released report on civilian community rehabilitation centers and services were distributed to the doctors, showing how the basic blueprint for a model center could be adapted to the needs of any community.

As Dr. Frank H. Krusen, director of the Baruch Committee on Physical Medicine and chairman of the committee for the exhibit, said at the close of Friday's session, "The average general practitioner has been so overworked during the war years because of the shortage of physicians, that he has little realization of the advancements made in physical medicine during the last four or five years.

"He has read the reports in professional medical journals, but they could not convey the important role that physical medicine played in the rehabilitation of our war casualties. Our primary concern now is to make the medical profession as a group aware of these advances in order that our millions of disabled civilians may receive the same benefits which are given to our handicapped servicemen and veterans."

ELECTROSHOCK THERAPY WITH 200 MILLIAMPERES FOR TEN SECONDS *

CLARENCE W. OLSEN, M.D.

and

L. C. DALE

LOS ANGELES, CALIF.

The three essentials of electrical stimulation to produce fits are as follows:

1. Sufficient current and time to induce the grand mal reaction. The minimal stimulation to produce a grand mal reaction is 200 milliamperes for 0.1 second. To approach 100 per cent of grand mal reactions in a series of stimulations, 500 milliamperes of current for 0.4 second is necessary.¹

2. Sufficient initial stunning effect to prevent feeling of electrical stimulation. A current of 200 milliamperes is momentarily but unpleasantly perceptible to some patients. A somewhat higher current is

* From the Department of Nervous Diseases, College of Medical Evangelists.

1. Sulzbach, W.; Tillotson, R. J.; Guellemine, V., Jr., and Sutherland, G. F.: A Consideration of Some Experiences with Electric Shock Treatment in Mental Diseases with Special Regard to Various Psychosomatic Phenomena and to Certain Electrotechnical Factors, *Am. J. Psychiat.* 99:519-524 (Jan.) 1943.

necessary to insure the initial stunning effect that constitutes a desirable feature of electroshock therapy.

3. Control of factors affecting safety. Besides quantitative regulation of current and time, protection against stray currents is imperative. The current used in electroshock must be confined to the patient's head. Accidental passage of the current through the body of the patient or his attendants can be a serious matter. An isolation transformer in the apparatus and the avoidance of any electrical contact of the patient to the ground or to any one else during the passage of current gives maximal protection against stray currents.

Electroshock units are devices for measuring and controlling current and time. The units now in general use provide split second timing, but not all provide accurate control of current. With accurate and flexible current control, it has been shown that a current of 160 to 250 milliamperes for thirty seconds followed by 60 to 125 milliamperes for five to ten minutes is tolerated by patients without evident detriment. This technic has been reported under the name of electronarcosis.²

It appears that when one deals with controlled current, split second timing is unnecessary. Stimulation with 160 to 250 milliamperes for thirty seconds as practiced in electronarcosis usually causes a modified grand mal reaction, which in many respects is equivalent to the effect of electroshock with higher currents for fractions of a second. The apparatus designed for electronarcosis is thus adapted for electroshock therapy of a modified type.

Absolute current control requires a rather complicated electronic circuit.³ Less rigid yet adequate and convenient control is possible with an ordinary electric light bulb of suitable power in series with the patient's head.⁴

The regulating effect results from the fact that the filament has low resistance when cold and high resistance when incandescent. When convex metal electrodes 5 cm. in diameter are placed bitemporally, the average resistance of the patient's head during treatment is 330 ohms. If 50 to 60 cycle alternating current with voltage of 115 is turned into a circuit consisting of a 60 watt bulb in series with a 330 ohm resistor, there is an initial surge not exceeding 350 milliamperes followed by rapid decline to 250 milliamperes as the filament heats. The voltage across the resistor drops to 60 or 70. In treatment, the initial surge insures against sensation of electrical current. The subsequent lower level of current can be applied for several seconds, until the grand mal reaction commences. The compensating quality of this circuit is such that a variation of 100 ohms in the resistance of the patient's head causes a deviation of 20 milliamperes from the estimated current level.

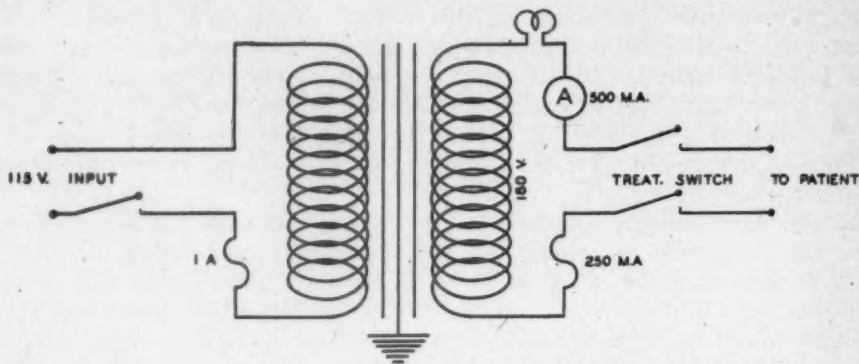
In over 1,000 treatments with an apparatus incorporating an isolation transformer and an electric light bulb, with current output adjusted to 200 milliamperes through effective resistance of 330 ohms, it has been found that ten seconds is sufficient in more than 90 per cent of stimulations to induce a satisfactory grand mal reaction. While the reaction obtained is very similar to fits produced by currents of high amperage for a fraction of a second, it has been observed that owing to tetanic contraction of the temporal muscles during passage of current the jaws remain clenched and there is little tendency to dislocation of the jaw or displacement of whatever device is used to protect the tongue and the lips. The hazard of fracture is neither more nor less, apparently, than in standard electroshock therapy.*

2. Frostig, J. P.; van Harreveld, A.; Tyler, D. B., and Wiersma, C. A. G.: *Electronarcosis in Animals and in Man*, Arch. Neurol. & Psychiat. 51:232-242 (March) 1944.

3. Plesset, M. S.: "Description of Electronarcosis Machine," J. Nerve. & Ment. Dis. 103:163-165 (Feb.) 1946.

4. We are grateful to M. S. Plesset, of Rosemead, Calif., for assistance and counsel.

The circuit used is shown in the figure. The isolation transformer is rated at 225 milliamperes, with 115 volts primary and 180 volts secondary.



Circuit of apparatus for electroshock treatment.

The bulb in the secondary circuit (25 watts) has a resistance varying from 75 ohms cold to 540 ohms at rated power and provides adequate control of current in the presence of varying resistance on the patient's part. Fuses in the primary and secondary circuits (1 A. and $\frac{1}{4}$ A., respectively), are for additional protection in case of breakdown of the apparatus.

Summary

1. The essentials of electroshock therapy are sufficient current and time to induce the grand mal reaction, sufficient initial stunning effect to prevent feeling of electrical stimulation and control of factors affecting safety.
2. When one is dealing with controlled current, split second timing is unnecessary.
3. A current of 200 milliamperes for ten seconds produces a modified grand mal reaction in more than 90 per cent of stimulations.
5. A brief description of a circuit for giving the treatment described is appended. This circuit does not change the sine curve of the alternating current.

* Recently the authors have learned of one case of fracture of the humerus and one case of fracture of the femur resulting from ordinary electroshock treatment, in patients who had previously had one or more uneventful treatments with 200 milliamperes for 10 seconds.

HOTEL RESERVATIONS

Have you made your hotel reservations for our New York session? To avoid disappointment on arrival make your reservation in advance.

See announcement elsewhere this issue.

EXHIBIT ON PHYSICAL MEDICINE

Physical Therapy, Occupational Therapy and Rehabilitation

SPECIAL EXHIBIT COMMITTEE ON PHYSICAL MEDICINE OF THE AMERICAN MEDICAL ASSOCIATION *†

Recent Developments in Physical Medicine

Physical medicine includes the employment of the physical and other effective properties of ultraviolet and infra-red radiation, heat, cold, water, electricity, massage, manipulation, exercise and mechanical devices for diagnosis and for physical and occupational therapy. Physical medicine is really applied biophysics.

Physical medicine has become a distinct and important medical specialty. It includes:

1. Definitive physical therapy.
2. The employment of physical agents for diagnosis.
3. Occupational therapy.
4. Physical rehabilitation.

Recently the Council on Physical Medicine of the American Medical Association voted to sponsor the designation "physiatrist" to describe the physician who specializes in physical medicine. The term "physiatrist" stems from the two Greek words "physis" (pertaining to physical phenomena) and "iatreia" (pertaining to healer or physician). Thus a physiatrist is a physician who employs physical agents.

The Baruch Committee on Physical Medicine concluded that the *three chief needs* in physical medicine are:

1. An adequate supply of physicians who can teach and use physical medicine.
2. More extensive basic and clinical research in physical medicine.
3. Proper use of physical medicine in relation to rehabilitation.

Physical medicine is the broadest of all medical specialties.

In the average hospital, approximately 10 per cent of all patients require some form of definitive physical treatment. In the hospital, it is just as important to have a physiatrist (physician specializing in physical medicine) in charge of the department of physical medicine as it is to have a roentgenologist in charge of the department of roentgenology or a clinical pathologist in charge of the clinical laboratory.

New centers for teaching and research in physical medicine have recently been established in a number of medical schools, including:

Columbia University, College of Physicians and Surgeons.
Emory University, School of Medicine.
Harvard University, School of Medicine.
University of Kansas, School of Medicine.
New York University, School of Medicine.
University of Pennsylvania, School of Medicine.
University of Southern California, School of Medicine.
Medical College of Virginia.

A new center for teaching of technology and biophysics as related to physical medicine has been established at Massachusetts Institute of Tech-

* The members of the committee—Frank H. Krusen, M.D., Chairman; Winfred Overholser, M.D., and Howard A. Rusk, M.D., were assisted by Frances Baker, M.D.; George G. Deaver, M.D.; Thomas L. DeLorme, Jr., M.D.; Harry Etter, M.D.; Frances A. Hellebrandt, M.D.; O. Leonard Huddleston, M.D.; A. B. C. Knudson, M.D.; Kurt Lion, M.D.; William H. Northway, M.D.; Carl M. Peterson, M.D.; Herman L. Rudolph, M.D., and Augustus Thorndike, M.D.

† Scientific Exhibit, San Francisco Session, 1946.

nology. Forty-one fellowships or residencies in physical medicine are now available annually at twenty-seven medical institutions.

At last, not only the science but the art of physical medicine is developing rapidly and along sound lines.

The Community Rehabilitation Center

Rehabilitation includes the employment of physical medicine, psychosocial adjustment and vocational retraining in an attempt to achieve the maximal function and adjustment of the individual and to prepare him physically, mentally, socially and vocationally for the fullest possible life compatible with his abilities and disabilities. Rehabilitation fills the gap between the customary end point of medical care and the real necessities of most patients.

Rehabilitation has been called "the much neglected third phase of medicine."

Rehabilitation begins when a man is first injured or becomes ill and ends *only* when he is completely restored to maximal activity. There is need for more scientific medical supervision of the convalescent phase of medical care. There is extreme need for the establishment of many more community rehabilitation centers. The community rehabilitation center should include:

1. An administrative staff.
2. Medical services division.
 - (a) Physical medicine branch.
 - (1) Physical therapy section.
 - (2) Occupational therapy section.
 - (3) Physical education section.
 - (b) Psychosocial branch.
 - (1) Clinical psychologic section.
 - (2) Social service section.
3. Vocational services division.
 - (a) Vocational education branch.
 - (b) Special education branch.
 - (c) Vocational guidance and testing branch.
 - (d) Sheltered workshop.
 - (e) Curative workshop.
 - (f) Homebound program.

There are approximately 23,000,000 handicapped persons in the United States. Approximately 97 per cent of all handicapped persons can be rehabilitated to a point at which they can obtain gainful employment. The rehabilitation center must be a part of the community rather than a thing within it.

Proper rehabilitation of handicapped persons in each community will be repaid in enormous dividends of health, happiness, opportunity and productivity.

Education in Physical Medicine

There is a rapidly growing appreciation of the importance of physical medicine as an integral part of medical practice. Physical medicine (the combined use of physical therapy, occupational therapy and physical rehabilitation of convalescent or disabled patients) has achieved new heights of development in our military hospitals during World War II.

Teaching and research projects in physical medicine, in civilian institutions, have expanded enormously during World War II. Early in World War II, a leading orthopedist predicted: "The last war established orthopedics as a recognized specialty; this war may well do the same for physical medicine." This prediction has now been amply fulfilled. There is still need for more trained leaders in the field of physical medicine. There is need for expansion

of the teaching of biophysics in the preclinical years of the undergraduate medical course. There is need also for development of adequate clinical courses in the application of physical medicine in many medical schools. Opportunities for postgraduate study in physical medicine have increased markedly during the war period.

Civilian hospitals should follow the lead of military hospitals in better coordination of physical therapy, occupational therapy and rehabilitation under the direction of a qualified medical specialist in physical medicine (a physiatrist).

Alan Gregg, medical director of the Rockefeller Foundation, has said: "Among my major hopes, let me record the wish that biophysics may be soon recognized as the brother of biochemistry. . . . One of the natural outgrowths of such a preclinical science might be the now long overdue development of physical therapy in this country."

This hope is now beginning to be realized.

It is at last evident that expansion of education in physical medicine will continue of its own momentum as medical educators with vision follow the lead of those who have already established teaching and research programs.

Technology and Medicine

Hardly any other field of science is as misunderstood as medical research. The public usually envisions a physician suddenly conceiving a new idea at the sick bed. He makes a few experiments, preferably on himself. At first he is not believed; then he cures thousands of people!

Medical research does not follow such a course. It is usually a slow and painful piecing together of unspectacular material derived from many sources.

In the past, chemistry has played an important role in medicine, whereas the participation of physics has been relatively limited. Many physical agents employed in medicine are nonspecific in action; hence their value has been minimized. Also physical agents have been little employed in medicine in the past simply because physics is too difficult. Now, a decided change in the use of physical agents in medicine has occurred. New technical and theoretical means of research in physical medicine are available. The war has stimulated important research in physiology as related to physical phenomena.

Recently the number of articles and books about physical medicine, biophysics and medical physics has increased considerably. There is much evidence of the desire to make the results of recent physical and technologic investigations available for the service of biology, medicine or public health.

The newer approach in physical medicine involves a quantitative study of the effects of the various physical phenomena acting on the living organism and investigate step by step the results of these actions. Biologic and medical results can be correlated with the physical phenomena causing them. Physical and technologic research may brilliantly complement clinical observation in furnishing the guiding principles for supplying medical men with new equipment. Numerous new diagnostic and therapeutic applications of physical medicine are now available.

New diagnostic devices include:

- The electronic stethoscope.
- The electro-encephalograph.
- The psychogalvanic reflexometer.

New therapeutic devices include:

Microwave high frequency apparatus.
Electric shock therapy equipment.
Apparatus for electronarcosis.

To establish effective liaison between physics and medicine, not only must the physicist know more about biology and medicine than he has in the past, but the physician must employ the physical way of thinking and must acquire knowledge of available physical technologic methods.

Physical Medicine in Military Hospitals

Of a collection of sixty-three war paintings showing Army and Navy medicine, twenty-one (exactly a third) depict some phase of physical medicine. This indicates the extensive employment of physical medicine in our military hospitals.

Heliotherapy, fever therapy, hydrotherapy (whirlpool baths and Hubbard tanks), corrective and reconditioning exercises and occupational and recreational therapy are all employed extensively in military hospitals.

Military hospitals have set new standards in physical medicine (coordinated physical therapy, occupational therapy and rehabilitation) which must be emulated by civilian hospitals.

Reconditioning in Chest Diseases

To achieve proper rehabilitation of patients with certain chest diseases (particularly following thoracic surgery), it is necessary to have a well ordered program which includes four important elements:

1. Physical reconditioning.
2. Educational reconditioning.
3. Occupational therapy.
4. Recreation.

The program must be initiated as early in the convalescent period as possible.

The problems to be overcome in physical reconditioning of the patient convalescing from a surgical disease of the chest are:

1. Lowered vital capacity.
2. Decrease in stamina and strength incident to a protracted debilitating illness.
3. Postural defects.
4. Loss of power of large groups of muscles incident to extensive cutting of muscles.

In suppurative diseases of the pleura and lungs, physical exercises should be started as soon after operation as the patient has become afebrile and regained sufficient strength. Exercises include deep breathing, calisthenics and drills. Vigorous exercise hastens the obliteration of cavities due to empyema or pulmonary abscess. By the time the cavity has disappeared, the patient is usually restored to normal weight, stamina and strength.

Reconditioning following *pulmonary resection* or *exploratory thoracotomy* can be divided into three stages:

1. The immediate convalescent care (during the first postoperative week).
2. The physical therapeutic period (from the seventh to twenty-first postoperative day).
3. The period from the twenty-first postoperative day to the time of discharge from the hospital.

During the second stage (seventh to twenty-first day), breathing exercises and shoulder exercises are employed twice daily while the patient is still confined to his room.

Shoulder exercises consist of:

1. Motion of the arm on the affected side through complete range.
2. Repeated passive movements through full range.
3. Later active assistive exercise and active exercise of the shoulder girdle.

Shoulder exercises:

1. Prevent contractures.
2. Prevent limitation of motion.
3. Are unilateral and confined to the side on which the operation was performed.

Breathing exercises consist of:

1. Contractions of the accessory respiratory muscles.
2. Contractions of the regular inspiratory muscles during strong forced breathing

Breathing exercises:

1. Increase vital capacity.
2. Are bilateral and symmetrical.

If there is associated muscular soreness, rigidity or limitation of motion, radiant heat or hot packs should be applied before starting exercises. General ultraviolet irradiations should be employed routinely to stimulate immunity reactions and increase the patient's general strength. After the third postoperative week, the patient can usually start vigorous exercise to increase vital capacity and restore the strength of the shoulder girdle. For younger patients, the exercises may include use of Indian clubs, rowing machines, pulley weights, dumbbells, straddle pull-ups, push-ups, chin-ups and resistive exercises. Swimming is valuable. Occupational therapy, educational reconditioning and recreational therapy are all useful adjuncts in rehabilitation of patients who have surgical diseases of the chest.

Proper coordination of physical, occupational and recreational therapy is extremely effective in rehabilitation of patients convalescing following surgical diseases of the chest.

Heavy Resistance Exercise Therapy

Exercise therapy is essential in restoring function to muscles weakened and atrophied by injury or disease. Exercise can be classified, according to the quality it imparts to a muscle, as follows:

1. Power.
2. Endurance.
3. Speed.
4. Coordination.

A common error is to attempt to restore power by endurance building exercises. Power is best restored by means of heavy resistance, low repetition exercises. The rate and extent of muscular hypertrophy are usually proportional to the amount of resistance the muscle must overcome. Even extremely atrophied muscles should exert their maximal effort at regular intervals.

The principles of heavy resistance exercise therapy are as follows:

1. Exert maximal effort only once every seven to ten days.
2. Practice complete flexion and extension with each repetition.
3. Avoid sudden, jerky motions when using weights.
4. Pause before each repetition and momentarily relax the muscle being exercised.
5. Never do more than ten to fifteen repetitions with any one poundage.
6. Total number of repetitions at one session is seventy to one hundred.
7. Never begin session with heavy weights—start with light weights and increase.
8. Weights should be raised and lowered at the same speed.
9. Concentrate on the muscles being exercised.
10. Exercise for about thirty minutes daily for only five days a week—then give the muscles a two day rest.

Since the exercise periods are short and occur only once daily, the patient does not tire of the program.

General principles of exercise therapy are as follows:

1. Low repetition, high resistance exercises produce power.
2. High repetition, low resistance exercises produce endurance.
3. Either of these types of exercises is incapable of producing the results obtained by the other.
4. Weakened atrophied muscles should not be subjected to endurance building exercises until muscular power has been restored to normal by power building exercises.
5. It is usually preferable to have a limited range of motion with good power rather than normal range of motion with inadequate power.

Low repetition, high resistance exercises are extremely useful in restoring the power of atrophied muscles and their volume should not be overlooked.

Rehabilitation of Amputees

Following amputation, physical therapy, occupational therapy and physical rehabilitation are employed to restore the patient to an active life. Physical therapy is limited chiefly to the application of physical exercises, either corrective, as in the case of contractures and weakness of the muscles of the stump, or for gait training. Radiant heat and massage are not employed except under special circumstances. The whirlpool bath may be of great value in management of chronic inflammation or circulatory deficiency of the stump. Occupational therapy contributes much to the program, especially in the training of upper extremity amputees.

Rehabilitation should promote the utilization of the physical and mental powers of the amputee to achieve optimal social and civil adjustment. A good rehabilitation program in the hospital soon solves the problems of the amputee concerning his capacity to work and his ability to participate in the routines of daily living.

The amputee has four major objectives to achieve:

1. Satisfactory social life.
2. The ability to care for himself.
3. Satisfactory transportation.
4. Satisfactory employment.

The foundations for achieving these objectives should be laid in the hospital rehabilitation program. The first step in rehabilitation of the amputee is to provide a prosthesis which gives physical restoration by concealing the defect and replacing the lost function.

The objectives of personal care, transportation and social living are important but the major factor in successful rehabilitation of the amputee is his economic adjustment. Economic adjustment of the amputee requires vocational guidance, orientation and training. The Navy has provided educational services officers to counsel and guide amputees in the choice of a future occupation.

The special exhibit committee on physical medicine observes that vocational guidance, orientation and training are primarily a medical problem and that civilian medical organizations have been woefully weak in providing proper hospital background for such services. Civilian hospitals would do well to emulate the military hospitals in providing such services. The best technics of vocational guidance, orientation and training should be made available while the amputee is in the hospital. An appraisal of the patient's capacities and abilities, his interests and aspirations can be obtained by observation, by interviews and by aptitude testing. Trade training raises many physically handicapped amputees from the unskilled to the semiskilled or skilled class, thus ensuring greater economic returns and personal satisfaction.

When the amputee is discharged from the hospital, he should have been physically restored by provision of a suitable prosthesis which he has been trained to use properly and he should have been vocationally guided and trained and thus prepared to resume his life work with proper comprehension of his problems.

Restoring Injured Workers

There is need for reduction of loss of time and productivity following industrial accidents. Rehabilitation centers for rapid restoration of injured workers have proved remarkably effective. An intensive program of rehabilitation, including physical therapy, occupational therapy and recreational therapy continued throughout a large portion of the day, should be employed. A rehabilitation center bridges an important gap in the return journey of an injured worker to health and normal income producing work.

After discharge from the hospital, accident victims often face a long and discouraging period of convalescence and idleness. They may become mentally depressed and lack of exercise may lead to muscular atrophy and fixation of joints. The primary function of the industrial rehabilitation center is to provide convalescent care which lessens the length of disability by early and adequate therapy. Once the qualified technicians, working under direct medical supervision, have been able to enlist the patient's cooperation and to overcome his fear, rehabilitation is well started. The gradual change in the attitude of the patient is often dramatic. Discouragement following prolonged inactivity and fear of pain are overcome by persuasion and example as he is led to enter the activities of the center. Soon a complete change in mental attitude and personality may occur.

Treatment at the center should start as soon as the patient is able to move about.

Delay in inaugurating rehabilitation procedures is the most frequent cause of failure. If there is too much delay in instituting a program of rehabilitation, muscular atrophy, fixation of joints and mental depression may progress to a point at which complete restoration becomes impossible.

There is tremendous need for the establishment of more industrial rehabilitation centers for restoring injured workers, where physical therapy, occupational therapy and recreational therapy can be combined to effect rapid recovery and early return to normal productivity.

Physical Rehabilitation of Paraplegics

Until recently, adequate rehabilitation of patients who had paralysis following injury of the spinal cord was much neglected. Experiences during the war have taught us a great deal about satisfactory methods of rehabilitating paraplegics. The lessons learned in the war should be utilized in better care of paraplegics in civilian institutions in the postwar era.

Rehabilitation of the paraplegic should be carried out by a team of physicians including:

1. The neurosurgeon.
2. The orthopedist.
3. The physiatrist (specialist in physical medicine).
4. The urologist.
5. The psychiatrist.
6. The plastic surgeon.

Skilled nursing is essential in the care of paraplegics and specially trained nurses can contribute greatly to the program for their rehabilitation.

Skilled technical assistants are essential to the program for rehabilitation of paraplegics. These include:

1. Physical therapists.
2. Occupational therapists.
3. Physical educators.
4. Social workers.
5. Educational training officers.
6. Vocational counselors.

The main objective in rehabilitation of paraplegics should be, not only to get the patient walking, not only to get him home, but to *get him back to work*. A high percentage of paraplegics can achieve normal control of bowels and bladder. The diagnostic survey of the paraplegic should be made on the basis of the existing pathologic lesions. At least 50 per cent of paraplegics should be able to become self supporting. Proper training of the paraplegic in ambulation and in mastering of the procedures essential to daily living and personal independence, is indispensable.

Modern methods of physical rehabilitation of paraplegics have revolutionized their convalescent care. Patients formerly permitted to lie hopelessly in bed are now being trained to become self-supporting, self-respecting citizens.

Vocational Placement of Handicapped Workers

Physical rehabilitation of a sick or injured person will be of no avail unless he is placed in a suitable occupation. Scientific job placement of the physically handicapped person is essential for successful rehabilitation. Physical medicine can usually restore a disabled person to a point at which he is capable of gainful employment and self-support but then he must be placed in a job which is commensurate with his abilities and disabilities.

A method of job analysis designed for the purpose of placement of handicapped workers is essential to any plan for their rehabilitation.

A method of reporting results of physical examinations is essential in assuring proper placement of handicapped workers. A technic for matching men to jobs, employing a screening method, is an extremely useful procedure.

Delineation of the considerations involved in job placement may be divided into four parts:

1. Physical demands.
2. Job conditions.
3. Safety factors.
4. Industrial health factors.

Scientific vocational placement must supplement physical rehabilitation in order to achieve satisfactory livelihoods and self-reliance for handicapped workers.



RAPID REHABILITATION FOLLOWING HAND INJURIES *

HAROLD LEFKOE, M.A., M.D., D.N.B., A.1.C.S.

Orthopedic Surgeon, St. Luke's and Children's Medical Center; St. Joseph's Hospital; Jewish Hospital; Philadelphia; Consultant Orthopedic Surgeon, Coatesville Hospital

PHILADELPHIA

It is not the province of this paper to go into the surgical technics and principles which have been the standby of the well trained hand surgeon in the past or into those which have been brought to the fore by the unfortunately large amount of material which resulted from the recent world catastrophe. We present this paper to help the patient after he leaves the operating room, in order to hasten his return to the role of a self-supporting worker. We only mention, and will not repeat, that adherence to sound orthopedic principles would minimize the postoperative rehabilitation problem tremendously.¹ Bunnell, for example, reports having seen much preventable crippling, due to stiffening of joints, to faulty position of the hand in immobilization, to excessive induration which should never have developed or to malunion of fractures which should have healed in proper position.

Hand and finger injuries are beginning to assume their true importance in the surgeon's vista. In 1941 they accounted for 77 per cent of all permanent impairments in the field of manufacturing; in 1942, for 79 per cent, and in 1943, for seventy-eight per cent.² We have come to the time when hand injuries are no longer considered "minor surgery"; but as "major surgery" the hand is too often treated as a surgeon would treat an appendix, a gall-bladder or a hernia—he operates, discharges the patient from the hospital and hopes that he will gradually return to normal with time.

There are papers galore covering the surgical technic of hand operations, including both primary and secondary surgical care. Padgett, through his simplified instrument and its successors, has increased the use made of the skin graft for closure of a granulating wound.³ Surgeons skilled in hand surgery have developed new technics and new concepts. Nevertheless, the paper or book which mentions at all or gives more than a line to the detail of the follow-up care after definitive surgical treatment is a rarity. This is true in spite of the fact that a ninety minute operation on a hand may show its best and end result only at the end of ninety days of physical therapy at home as well as in the hospital. An excellent paper on industrial injuries to fingers⁴ does not mention rehabilitation, nor does another, on the treatment of hand injuries.⁵ Another writer⁶ skims over the subject by saying that "proper education of the individual in guidance and therapy over a period of many months is an important principle in rehabilitation of the involved extremity." Still another⁷ writing on compound hand injuries, mentions it only in connection with the aftercare of tendon injuries.

The use of the term "physical therapy" is widely misunderstood. No less an authority than Bunnell⁸ has made the statement, "Actual use of the hand and the passing of time are more valuable than is so-called physiotherapy." We cannot go along with Bunnell⁹ in his deprecation of the value

* Read at the Eastern Sectional Meeting, American Congress of Physical Medicine, Washington, D. C., April 13, 1946.

1. Bunnell (c); Praff; Pruce.
2. Kossoris.
3. Padgett.
4. Toland.
5. Koch (b).
6. Siler.
7. Mueller.
8. Bunnell (b).
9. Bunnell (b), (c).

of physical medicine. Such a regimen as he suggests might well improve function, but not to a maximum, because of the substitution of muscles.

In our opinion, in an endeavor to cut down the period of disability, certain physicians try from the practical standpoint to adapt a patient to his former work as quickly as possible—even at the sacrifice of some recovery which might otherwise be obtained. To our way of thinking, this should not be done in the acute or early stage of convalescence, though we use the principle ourselves in the prolonged disability where rehabilitation is an important economic factor.

The role of occupational therapy is not to be underrated. The Philadelphia Naval Hospital and Valley Forge General Hospital have excellent departments for this work. Insurance companies showed the way, and the service hospitals have been ready to cooperate with industry as industry was eager to cooperate with them, to take occupational therapy out of the stage of impracticality into which it had bogged down. However, occupational therapy cannot make use of a muscle until that muscle has been taught how to work. Just as a man with a weak deltoid will do a job he is given by rotating his scapula; just as a man with a weak biceps will flex his forearm by using his brachioradialis, so will a man work with his thenar muscle to give him a grip rather than take the time to struggle and bring all the finger joints into normal contraction; so will he take his arm into flexion and external rotation while using a screw driver rather than fight for the last few degrees of supination unless the physical therapist is at hand to instruct, coax, plead, check, cajole, threaten, browbeat and finally emerge triumphant with a completely normal motion.

It might be mentioned in passing that the recognition of so-called trick, supplementary or substitution movements is of considerable importance to the orthopedic surgeon and to the physiatrist. Failure to recognize them may lead to failure to recognize a nerve lesion or to a false estimate of its extent, with subsequent incorrect diagnosis and false prognosis as well as faulty evaluation of a surgical procedure undertaken for correction of the lesion.¹⁰ In the hand, for example, there is a tendency to substitute wide motion in the metacarpophalangeal joints for flexion and extension of the interphalangeal joints. Where there has been restriction of flexion of all hand joints one often notices a substitute elevation of the thenar eminence.

Koch¹¹ says that carefully administered first aid is the most important single step leading to a good functional result in the treatment of hand injuries. Then comes the choice of the anesthetic for the definitive operation. We are heartily in favor of brachial block so long as frank bone surgery is not required. Recovery from this type of regional anesthesia is rapid, and there is no time lost in engaging the patient's cooperation. Brachial block also allows the use of a tourniquet around the arm, where it is much more efficient than elsewhere on the upper extremity. Lower applications may not compress vessels which are protected as they lie in the interosseous space.

The amazing rapidity of the onset of stiffness in the joints of the hand is learned early by the physiatrist but is sometimes never learned by the surgeon who does not give his cases adequate follow-up. Not uncommonly, the inability on the part of the patient to perform active movements and the failure to maintain passive movements have been quite as important factors in contributing to the joint fixation as have the original injury or infection.¹¹ Infection, you see, must creep into any discussion on hand injury, because except in rare instances infection usually follows some injury.

10. Sunderland (a).

11. Koch (a).

Harmer¹² was one of the first to advocate early active motion of the involved muscles following tenorrhaphy. Since then, that has become generally acceptable. Bunnell¹³ feels following tendon suture union is strong enough for moderate exercises in three weeks and that in four weeks the danger of breaking is over.

Early closure of hand wounds by a thin split thickness graft has resulted in lessened induration, less scar tissue formation and lessened incidence of flexion contracture. In burns of the hand, the third degree burns, of course, require complete skin grafting. It is important to remember that first and second degree involvement may still go on to a poorly functioning hand. Dressings should be changed daily, and each finger should be dressed separately. Pressure dressings eliminate much of the early loss of tissue fluids, which would otherwise leave the body rapidly. In efforts at rapid rehabilitation, Smith and his group¹⁴ arbitrarily set five days following grafting as the total period of splinting and postoperative elevation. At the end of that time, the dressing is removed entirely and the patient receives submersion baths three times a day. The modern concept of a burn is that it is of particular importance only because it is a traumatic wound of extensive surface, with consequent prolonged immobilization and secondary scar formation, and both of these must be kept at a minimum.¹⁵

Surgeons are utilizing immediate skin grafts more and more frequently in traumatic amputation of a finger.¹⁶ The grafted skin, however, is abnormally tender for months. We have found that this tenderness can be largely eliminated by the use of 5 per cent tannic acid freshly prepared in 2.5 per cent aqueous solution of sodium bicarbonate. This solution both toughens the skin and makes the sensory end organs less sensitive.

Both full thickness and partial thickness grafts often show a transient cyanosis, which concerns the patient chiefly because of its appearance. It is best relieved by alternate elevation and dependency. Occasionally a bleb appears in the graft, the fluid content varying from sanguinous to sero-sanguinous. With its appearance there is usually a history of unwonted activity or an unusual amount of dependency. The bleb should be aspirated without removal of the upper layer (which is allowed to remain as a temporary protective covering), and physical therapy may then be continued within tolerated amounts.

Between mobilization efforts both within the physical medicine department and outside it, if continuous immobilization is desired care should be taken to see that such immobilization is applied only to the local part where it is of value. If a finger or part of a finger requires immobilization, there is no excuse for a plaster including the entire hand or immobilizing other fingers. The principle of occasional motion of a joint¹⁷ interrupting what is essentially continuous immobilization is being used by us more and more.

Following knuckle arthroplasty, active and guided active motion may be started in one week postoperatively, but between the attempts at mobilization the joint should be kept splinted at 120 degrees. In these cases, remember that the interosseus and the lumbricales muscles are the only flexors of the knuckles, but check with the surgeon and the operative record to see whether the flexor sublimus was transplanted into the lateral band. In those cases, a conscious attempt to flex the fingers at the interphalangeal joints, too, will assist in knuckle flexion.

It is generally said that following capsulotomy of the knuckle joint three

12. Harmer.

13. Bunnell (b).

14. B. Smith.

15. F. H. Smith.

16. Day; Kutler; McCarroll; Reed; Zadik.

weeks of flexion is the minimum and that thereafter it should be continued intermittently with physical therapy. It is our own feeling that complete immobilization in flexion is best maintained only until the acute soft tissue reaction has subsided, and that thereafter gentle guided active motion can be alternated throughout the day with complete fixation. The importance of careful supervision of the reapplication of postoperative splinting, traction and manipulation cannot be over emphasized, however.

The finger fracture seen most frequently is that of the terminal phalanx. All too frequently the digit is kept immobilized until the roentgenogram is reported as showing complete healing. One might just as well keep a fractured scapula immobilized until all signs of a fracture line are obliterated. Practically, as soon as the soft tissue damage has subsided one is ready to return to his regular duties.

The dangers of postponing early motion in the enthusiasm over post-reduction x-rays after the use of skin traction for fracture of the metacarpals or phalanges has been emphasized.¹⁷ Excellent anatomic position is a poor trade if it is secured at the expense of function. We are allowing our patients to release their traction for a few minutes several times a day in order to manipulate their own joints, with the feeling that what traction did once it can do again. Interphalangeal digits require constant attention and must be taught to work actively when the higher digit is held snugly. (We heartily endorse the use of the terms "high" and "low" in describing relative positions in the hand. This describes the hand as it is the anatomic position of the body with the patient standing and hands at the sides. Certainly, free discussion is limited when one must resort to the cumbersome "proximal and distal"; "more proximal" instead of "higher"; "more distal" instead of "lower.")

Early physical therapy following the Colles fracture has been advocated for years. It is true that in our experience, as well as in that of others, most patients with the difficult comminuted, intraarticular Colles fracture, properly reduced, completely immobilized and with the metacarpophalangeal joints completely free and movable, will finish with an early and excellent functional end result. But there is a minority of which we speak now—the cases in which the patient cannot or will not cooperate. Here Bunnell's knuckle bender¹⁸ is of no value, for the patient just will not use it. In these cases, paraffin cannot be used, for the patient complains that it is too hot and self-sympathizingly adds, "I can't go through that after all I've been through." It is in these cases that diethyl stilbestrol, vitamin E and intravenous procaine hydrochloride have been of greatest value.

Not only must the traumatic vasomotor background be considered in both sexes, but in women there is an endocrine problem in addition. During the rehabilitation period some women will develop symptoms characteristic of the climacteric, though their menses are still present and regular. The gynecologists long ago differentiated menopause and climacteric. Such a patient if menopausal will offer much greater cooperation under estrogenic therapy. Those who are not menopausal have responded well in our hands to Ephynal Acetate by mouth, in doses of 20 to 40 mg. daily.¹⁹

The use of procaine hydrochloride intravenously is to be recommended as an analgesic agent. For use as an adjunct to manipulation, 20 cc. of 0.1 per cent aqueous solution is administered, about two minutes being taken for the entire amount.²⁰ Pharmacologically, procaine is quickly hydrolyzed and detoxified by an enzyme in the blood stream, breaking down into para-

17. Harmer.

18. Bunnell (d).

19. Christy.

20. Allen; Boyd and Stone.

aminobenzoic acid and diethylaminoethanol, which are excreted by the kidney.²¹ Clinically, we definitely do not take advantage of the analgesia obtained in this manner to perform a forcible manipulation. However, with the pain lessened (thus eliminating the protective reaction that leads to further splinting and fibrosis)²² the patient can assist to his utmost capabilities in guided active motion. In our hands as well as in others, then, intravenous injection of procaine hydrochloride is another ancillary method in the therapeutic armamentarium necessary to obtain rapid mobilization following hand injuries.

The physical therapy technician must be taught all the details of hand bandaging and finger traction if bandages and traction are to be removed in the department and reapplied after treatment. The dressing must be soft and yet give good support; it must immobilize and yet give opportunity for muscle setting; it should be possible to get to the part for gentle massage, either manually or by the whirlpool, which at the same time lightens the actual weight the muscles must work upon. We have found no single dressing suited to all of our needs. Plaster is used most frequently, but we do not have any compunction in forsaking it for a massive compression bandage of sheet wadding and gauze bandage or for the newer waterproof silk (Airlite).

The physiatrist should watch the progress of his patient carefully and should never hesitate to admit that the patient's progress has reached a standstill. The ultimate in rapid rehabilitation is attained when the physicians in charge of a patient discuss frankly the relative merits of proposed methods of treatment. The orthopedic surgeon may eliminate the restricted supination by removing the distal inch of the ulnar shaft, while leaving the ulnar styloid in situ²³ and thus complete a rehabilitation which had reached an impasse, or he may restore proper leverage to tendons by a rotation osteotomy of a metacarpal. If he knows the surgeon well enough, the physiatrist might even suggest that plastic repair of the finger pad will bring about a more rapid rehabilitation than nature and the physiatrist working hand in hand can accomplish and with a more satisfactory result.²⁴

It is a well known rule to orthopedic surgeons that when muscle or tendon transplant is contemplated, best results are obtained when the muscle to be transposed is of good power. Many of the same men, however, do not take advantage of contraction of the newly implanted muscle by exactly controlled electrical stimulation as soon as the muscle is ready to function. Such contractions, controlled to degree, rate and completeness of reaction before the next contraction, should be given not as a substitute for voluntary movements but rather as an intermediate stage until voluntary action is well established.²⁵ Redevelopment of muscle power can be obtained only by mobilization plus coordination. Every muscle fiber must be brought into play to that end; exercises must be performed with a maximum of effort; they must be well sustained, and they must be allowed a subsequent period of complete relaxation.²⁶

In obtaining active exercise, it is our opinion that best results are obtained by training muscles individually wherever possible rather than as a component of a muscle group. Prolonged inactivity of muscles anywhere results in a mental alienation, and continued inactivity may result in atrophy and even in fibrosis. Just as in the case of the knee, where the patient trying to use his rectus femoris will try until he bites his lip and still get no

21. McLachlin.

22. Bunnell (b); Nachlas.

23. Boyd and Stone.

24. Meltzer and Fillinger.

25. Smart.

26. Ward.

more than a contraction of the vastus medialis and lateralis, so will a patient in spite of his best efforts be unable to coordinate the extensors of the wrist and hand. He may try so hard that his entire upper extremity goes into contraction without any extensor motion of the joints of the hand.²⁷ His first ability to contract those muscles may come when he is shown how to contract the flexors and make a fist. As he does so he watches the rippling of the coordinated but antagonistic extensor muscle bellies in the forearm. From that point, the carpal extensors, the common digit extensors and the interosseus muscles can be trained individually.

Others²⁸ as well as ourselves have recognized that getting gradually back to work is one of the best ways of improving an injured hand. In the armed services, however, and particularly during wartime, there is no place for a convalescent. Either he is doing full duty, or else he must be hospitalized. The same is true, too, of civilian life. State laws do not ease the liability of the insurance carrier, who is therefore not anxious to carry on another responsibility; union rules do not provide for part-time or light work or for a helper. Now, with the manpower situation easing, the boss is not so likely to hire a man at full salary for what he knows will be only part-time production. It is to be hoped that this problem will be ironed out in the future.

The multiplicity of modalities which we have utilized in the application of heat suggests that the differentiation is not too clearcut with regard to the respective advantages. Paraffin is still one of our favorites, and it does a particularly good job in removing interstitial fluid. The infra-red radiation ordinarily cannot heat the hand from all angles as readily as other methods do. The whirlpool is excellent, but it does not remove the fluid as well as does paraffin. The relative merits of the two will not be discussed here. The frequent use of a hot water soak at home is to be commended heartily, and a fifteen minute soak can be had while one is reading the first page of a newspaper. We have had no experience with a sack of warm sand.²⁹ Without regard to the most efficient method, though, all must be followed by massage. Especially in the beginning must this be mild and gentle.

When the hand is being massaged, the patient should always be lying on a table, with the arm, forearm and hand on the table. The massage can then be given with the patient completely relaxed. I have too often seen massage given to a hand *à la* the manicurist—the customer's extremity held out sideways from a barber's chair—with the patient tensing the entire shoulder and elbow as well as the hand and wrist in order to make it easier for the technician. In even the most expert of hands, an attempt at gentle massage is found to have been too much for that particular patient on that particular day. The patient should be warned of such a possibility and advised to place the hand in a sink of cold water with floating ice for five minutes at a time at least once every hour until the acute reaction has subsided.

We explain to the patient that he has twenty-four hours in every day and that he must make up his mind to spend most of them working on his own hand. We make a careful distinction in our own minds between functional and diversional occupational therapy. The coordination required in the nice handling of a paint brush, the resistive exercise performed in the shaping of a piece of pottery or the persistence of effort required in the sending of a telegram is sufficient to justify the use of these in rehabilitation.

27. Gocher.

28. Lewey and Bowles.

29. Bunnell (b).

At home the patient can use silicone or bouncing putty; he can practice rolling a handkerchief or half a newspaper sheet into the smallest possible space in the palm of his hand; he can maneuver his fingers into and around a sponge, a rubber ball or a water pistol, or he can be encouraged into the musical avocations which require the use of the fingers to change the notes.

We have apparently ignored in the past the so-called "physiopathic syndrome"³⁰ though Stern³¹ long ago divided people into two classes — the "swellers" and the "nonswellers." More recently Schorcher³² attributed to a constitutional inferiority of the neurovascular system, involving both the capillaries and the lymphatics, the traumatic edema of the hand which develops after a mild injury and follows a grave course to a rapid disability. We have also been aware of the vasospastic hand in industry, found after the prolonged use of vibrating tools.³³ Certainly many of the cases of thickened, edematous hands, with shiny skin, shiny nails and often with very marked "atrophy of disuse" in the roentgenogram, fit into Arnulf's category. Siddons³⁴ excellent review of the literature gives the background and the rationale of the procaine injection of the stellate ganglion which has proved such a useful adjunct in our own hands as well as in the hands of others. We prefer the long needle technic and the posterior approach, chiefly because we can appreciate the sensation of the patient who sees coming toward him a person who is pointing a long needle on the end of a long syringe and aiming for some spot in his neck.

Not all the thickening in hands is due to the same cause or will respond to the same treatment. The periarticular joint thickening following trauma, so frequently called a sprain, yet causing pain and mild disability for many months and a deformity which is sometimes permanent, has long been a problem to the traumatic surgeons. Papurt³⁵ has called attention to its possible pathology, an intra-articular effusion and hemorrhage causing pressure on the capsule, with hyperplasia of the cells of the capsule resulting in extreme thickening. He has made a small incision through the capsule, allowing the hemorrhage and effusion to escape, with excellent end results. Our own practice is to treat these sprains, sprain fractures and finger dislocations which are readily reduced (but tend to give the same residual periarticular thickening) by roentgen rays, to form rapid fibrosis of the embryonal connective tissue and thereby prevent further hyperplasia.

It should scarcely be necessary to mention the necessity of a proper diagnosis before one attempts rehabilitation. The use of the modalities of physical medicine without a complete knowledge of the diagnosis, the surgical measures already performed, the roentgen appearance of the part affected and the physical examination is to be decried loudly. We have seen patients referred for "baking and massage" simply on the basis of their complaint and without a physical examination having been done. Certainly, no matter how prolonged the use of the various modalities, no matter how assiduous the physiatrist and no matter how cooperative the patient, one will never restore the disability of the thumb following a Colles fracture when that disability on a careful physical examination is found to be due to a concomitant rupture of the long extensor of the thumb.

We need not go into the specific injuries reported in the literature.³⁵ We are waiting to see our first grease gun or high pressure oil wound,³⁶ and we plan to treat it with paraffin immersion in the hope of softening the sub-

30. Arnulf.

31. Stern.

32. Schorcher.

33. Gurdjian and Walker; Telford, McCann and MacCormack.

34. Siddons.

35. Papurt.

36. Telford, McCann and MacCormack; Gurdjian and Walker; Byrne; Brooke and Rooke; Hughes; Mason and Queen; Rees; F. H. Smith; Mason and Allen; MacCollum.

cutaneous grease and facilitating its expression through the sinuses already present. This might also eliminate some of the prolonged disuse of the finger tendons. An injury with an accompanying foreign body in the hand is to be treated as if there were already an infection present, for the vast majority of the hand infections seen in civilian practice began as puncture wounds or apparently minor foreign body penetrations. Statistically, it is generally accepted that no employee with an infected hand should be permitted to work, regardless of how much penicillin he is being given.

Conclusion

In industry we have solved the problem of the injured knee—we simply take out the meniscus; we have solved the problem of the painful back—we simply take out the disk; but the hand is gently folded and placed in the lap of the field of rehabilitation because there isn't much in the hand that can be taken out.

It is most important in the evaluation of a result (we avoid the redundancy of the term "end result") following injury to the hand to be able to answer three questions: 1. Is there any pain at all present? 2. Is function normal? 3. If normal function is present on examination can it be maintained throughout a complete working day?

Whether the patient is a surgeon, a nurse, a skilled mechanic or a laborer, he deserves a square deal following hand injuries, and the best result can be obtained only by persistent attention to detail in treatment.

Summary

The importance of rapid rehabilitation of hand injuries has been emphasized again.

An attempt is made to disseminate many of the already known physical medicine technics, so that their use will become more widespread.

Attention is called to new technics which should be accepted into the therapeutic armamentarium of the specialist in physical medicine and which should be used in conjunction with the older, well tried methods to accomplish a more rapid rehabilitation of the injured hand.

Medical Arts Building.

Bibliography

- Allen, F. M.: New Uses of Procaine (Preliminary Communication), *Arch. Phys. Med.* **26**:759 (Dec.) 1945.
- Ameuille, M. P.: La novocaine intraveineuse, *Progres med.* **73**:407 (Dec. 10) 1945.
- Arnulf, G.: Traitement par les infiltrations sympathiques des troubles reflexes post-traumatiques, dits physiopathiques. G. Arnulf. *Rev. d'orthop.* **30**:101 (Jan.) 1944.
- Bovd, H. B., and Stone, M. M.: Resection of Distal End of Ulna, *J. Bone & Joint Surg.* **26**:313 (April) 1944.
- Bunnell, S.: (a) Suggestions to Improve the Early Treatment of Hand Injuries, *Bull. U. S. Army M. Dept.* **88**:78 (May) 1945.
- (b) Reconstruction of Injured Hand, *Rocky Mountain M. J.* **35**:194 (March) 1938.
- (c) Observations on Hand Injuries, *Bull. U. S. Army M. Dept.* **86**:4 (March) 1945.
- (d) Knuckle Bender Splint, *Bull. U. S. Army M. Dept.* **5**:230 (Feb.) 1946.
- Byrne, J. J.: Grease Gun Injuries, *J. A. M. A.* **125**:405 (June 10) 1944.
- Brooke, R., and Rooke, C. J.: Two Cases of Grease-Gun Finger, *Brit. M. J.* **2**:1186 (Dec. 16) 1939.
- Christy, C. J.: Vitamin E in Menopause, *Am. J. Obst. & Gynec.* **50**:84 (Jan.) 1945.
- Day, H. F.: Immediate Flap Grafts Following Trauma, *New England J. Med.* **218**:758 (May 5) 1938.
- Gallagher, J. L.: Definitive Treatment of Severe Wounds; Large Surface to Small Area, *J. A. M. A.* **123**:675 (Nov. 13) 1943.
- Gocher, T. E. P.: Muscle Training in Industrial Injuries, *California & West. Med.* **39**:21 (July) 1933.

- Gurdjian, E. S., and Walker, L. W.: Traumatic Vasospastic Disease of the Hand (White Fingers), *J. A. M. A.* **129**:668 (Nov. 3) 1945.
- Harmer, T. W.: Injuries to Hand, *Am. J. Surg.* **42**:638 (Dec.) 1938.
- Hughes, J. E. (Shawnee, Okla.): Penetration of Tissue by Diesel Oil Under Pressure, *J. A. M. A.* **116**:2848 (June 28) 1941.
- Koch, S. L.: (a) Disabilities of Hand Resulting from Loss of Joint Function, *J. A. M. A.* **104**:30 (Jan. 5) 1935.
- (b) Treatment of Hand Injuries, *New England J. Med.* **225**:105 (July 17) 1941.
- Kossoris, M. D.: Work Injuries in the U. S. During 1943, Bull. No. 802, U. S. Bureau of Labor Statistics, U. S. Government Printing Office, 1945.
- Kutler, W.: Method for Repair of Finger Amputation, *Ohio State M. J.* **126**: (Feb.) 1944.
- Lewey, F. H., and Bowles, G. K.: Work Furloughs for Patients with Peripheral Nerve Injuries, *Bull. U. S. Army M. Dept.* **4**:683 (Dec.) 1945.
- Lundy, J. S.: Clinical Anesthesia, Philadelphia, W. B. Saunders Co., 1942.
- MacCollum, D. W.: Wringer Arm; Report of 26 Cases, *New England J. Med.* **218**:549 (March 31) 1938.
- Mason, M. L., and Allen, H. S.: Indelible Pencil Injuries to Hands, *Ann. Surg.* **113**:139 (Jan.) 1941.
- Mason, M. L., and Queen, F. B.: Grease Gun Injuries to Hand; Pathology and Treatment of Injuries (Oleomas) Following Injection of Grease Under High Pressure, *Quart. Bull. Northwestern Univ. M. School* **15**:122, 1941.
- McCarroll, H. R.: Immediate Application of Free Full-Thickness Skin Graft for Traumatic Amputation of Finger, *J. Bone & Joint Surg.* **26**:489 (July) 1944.
- McLachlin, J. A.: The Intravenous Use of Novocaine as a Substitute for Morphine in Postoperative Care, *Can. M. A. J.* **52**:383 (April) 1945.
- Meltzer, H. (Frankfurt a. M.), and Fillinger, F.: Dauerergebnisse nach Fingerkuppenplastik, *Chirurg* **8**:397 (May 15) 1936.
- Mueller, R. F.: Management of Compound Hand Injuries, *Minnesota Med.* **27**: 110 (Feb.) 1944.
- Nachlas, I. W.: A Splint for the Correction of Extension Contractures of the Metacarpophalangeal Joints, *J. Bone & Joint Surg.* **27**:507 (July) 1945.
- Padgett, E. C.: Skin Grafting from a Personal and Experimental Viewpoint, Springfield, Ill., Charles C. Thomas, Publisher, 1942.
- Pratt, D. R.: Suggestions on Immobilization of the Hand, *Bull. U. S. Army Med. Dept.* **86**:105 (March) 1945.
- Pruce, A. M.: Preventive Measures in Plaster Cast Applications, *Arch. Phys. Med.* **27**:30 (Jan.) 1946.
- Reed, J. V., and Harcourt, A. K.: Immediate Full Thickness Grafts to Finger Tips, *Surg., Gynec. & Obst.* **68**:925 (May) 1939.
- Rees, C. E.: Penetration of Tissue by Fuel Oil Under High Pressure from Diesel Engine, *J. A. M. A.* **109**:866 (Sept. 11) 1937.
- Schorcher, W.: Traumatic Edema of the Hand, *Beitr. z. klin. Chir.* **171**:176 (June 12) 1940.
- Siddons, A. H. M.: Sympathetic Block in Vascular Injuries, *Lancet* **2**:77 (July 21) 1945.
- Siler, V. E.: Management of Injuries and Infections of Upper Extremities, *J. A. M. A.* **124**:408 (Feb. 12) 1944.
- Smart, M.: Muscle Injury in Industry; Importance of Physical Medicine, *Brit. J. Phys. Med.* **8**:5 (Jan.-Feb.) 1945.
- Smith, B.; Cornell, C., and Neill, C. L.: Principles in Early Reconstructive Surgery of Severe Thermal Burns of the Hands, *Brit. J. Surg.* **33**:159 (Oct.) 1945.
- Smith, F. H.: Penetration of Tissue by Grease Under Pressure of 7,000 Pounds, *J. A. M. A.* **112**:907 (March 11) 1939.
- Snyder, M. H., and Snyder, W. H., Jr.: Traumatic Thrombosis of Deep Palmar Vein, *J. A. M. A.* **111**:2007 (Nov. 26) 1938.
- Stern, W. G., and Papurt, L. E.: Healing of Newer Bumper Fractures of Tibia, *J. A. M. A.* **105**:147 (Dec. 28) 1935.
- Sunderland, S.: (a) Voluntary Movements and Deceptive Action of Muscles in Peripheral Nerve Lesions, *Australian & New Zealand J. Surg.* **13**:160 (Jan.) 1944.
- (b) Flexion of Distal Phalanx of Thumb in Lesions of Median Nerve, *ibid.* p. 160.
- Telford, E. D.; McCann, M. B., and MacCormack, D. M.: "Dead Hand" in Users of Vibrating Tools, *Lancet* **2**:359 (Sept. 22) 1945.
- Toland, J. L., Jr., and Kornbluh, I. H.: Industrial Injuries to Fingers, *Pennsylvania M. J.* **47**:466 (Feb.) 1944.
- Ward, F. G.: "Orthopaedic" Rehabilitation, *Brit. M. J.* **44**:15:225 (Aug. 18) 1945.
- Zadik, F. R.: Immediate Skin Grafting for Traumatic Amputation of Finger Tips, *Lancet* **1**:335 (March 13) 1943.

Discussion

Dr. Dean M. Hayes (Washington, D. C.): Those of us who have treated hand injuries realize the necessity for rapid rehabilitation. We have seen many patients handicapped severely because of a crippled hand, which could have been saved from severe crippling if early mobilization had been instituted.

Dr. Lefkoe has aptly discussed the pertinent principles in the adequate treatment of these injuries which the medical profession should consider if we are to decrease the high percentage of disability resulting from hand injuries.

I have been surprised by the beautiful anatomic as well as functional results we have obtained in which complete immobilization was abandoned in an attempt to obtain good function in the hand. I would like to present the following case as an example of the results of rapid rehabilitation. The patient was seen two weeks following a gun shot wound of the right hand in which he sustained a compound comminuted fracture of the proximal one-fourth of the shaft of the second metacarpal and the lesser multangular bone with severe trauma to the adductor pollicis, flexor pollicis brevis and the opponens pollicis muscles. There was severe edema of the hand, with rather marked limitation of the fingers and thumb. The question arose as to whether to treat this injury with complete immobilization or early mobilization. The latter course was decided on. The patient was given daily whirlpool, massage and active exercises with the patient immobilizing the fracture of the metacarpal himself. Between treatments the wrist and

hand were immobilized in a plaster splint to the metacarpo-phalangeal joints. Early skin graft was done to cover the denuded areas. The patient was discharged two months later with an excellent functioning hand and a beautiful anatomic result in the fracture. The only complaint that the patient had was that the right thumb tired a little more quickly than formerly.

Early skin grafting of denuded areas is essential as it decreases or eliminates scar tissue which may limit function and often allows mobilization at an earlier date.

I consider the early use of submersion baths following skin grafting as an important aid in obtaining a rapid healthy take of the skin graft. I have used whirlpool baths, twice a day, five to seven days following grafting with excellent results.

I believe that many of the failures in tenorrhaphy and capsulotomy in the past have been due primarily to a prolonged period of immobilization.

Too much emphasis can not be placed on the fact that these patients should be under careful technical supervision because there is no other part of the body that has the potentiality for trick or substitution movements or presents more of a problem in development of coordination than the hand.

I am confident that we can appreciably reduce the high percentage of disability from hand injuries if the surgeon and the doctor of physical medicine or physical therapist, as the case may be, work together, keeping in mind the principles discussed in Dr. Lefkoe's paper.

THE REGISTRY EXAMINATION

C. D'A. GERKEN

Assistant Professor of Psychology, the State University of Iowa

IOWA CITY

Late in 1941 the American Registry of Physical Therapy Technicians substituted an objective examination for essay tests as a basis for deciding on the competence of technicians who were to be admitted to the Registry. It was believed that reliable and valid standards could be developed which would permit the evaluation of technicians' knowledge of their field by obtaining a wider sampling of coverage of background information than had previously been possible. Prior to this date all technicians, on applying to the Registry, were scheduled to write two day examinations, which were subsequently graded by a physician who was himself thoroughly acquainted with physical therapy. This physician decided on a percentage basis what grade should be assigned to each examination paper. It is almost needless to mention that such grades undoubtedly exhibited the unreliability which characterizes most essay examinations.

Since objective examinations have been used, it has been possible to reduce markedly the amount of time necessary to evaluate a technician's knowledge and the physician has been freed from the arduous and time-consuming task of reading many papers (and then puzzling over the meanings and values to be assigned to the answers). In addition, the time elapsing between the taking of the examination and the grading of the test has been reduced.

Three editions of the objective examination have been made, and a fourth will be available soon. Each examination is developed to measure as adequately as possible the kinds of information, knowledge and judgment making which characterize the trained technician expecting to work under the direction of a competent physician.

No item is included in any examination if it calls for information that laymen might well be expected to possess, and none is included which all technicians are presumably able to answer. In other words, items which comprise the examinations are those which are thought provoking or which demand that the technician use in a problem-solving fashion material covered in courses in physical therapy. No test can compare individuals fairly unless these criteria are met. If a test is to evaluate technicians, it must "spread" those who are tested over a range which has a high enough ceiling to permit the technician with the best background to make a very high score and which at the same time recognizes that even the least competent graduate possesses more than zero knowledge about the field.

The table shows grade-score equivalents for the current Registry Examination and the percentage of 1,290 graduate technicians who received

Grade-Score Equivalents on the Registry Examination and Percentage of Students Earning Each Grade

Range of Scores	Equivalent Grade	Percentage of Students
Above 215	A	16.4
195—215	B	23.8
188—194	C+	9.0
164—187	C	25.9
157—163	C—	5.6
147—156	D	5.6
140—146	D—	4.1
126—139	E	4.0
Below 126	F	3.7

each grade. There are 306 possible points on the examination. Scores of 140 ("D—") and above are considered passing. Slightly less than 8 per cent of the technicians applying for admittance to the Registry failed the examination.

Objective examinations, although nonperfect instruments, do have some characteristics not possessed by other types of tests. They have known reliability and validity. In other words, the extent to which they are nonperfect can be evaluated in numerical terms, whereas the imperfections of other types of tests are unknown and, therefore, usually unrecognized. In essence, reliability refers to the stability or constancy of a test; validity refers to its accuracy—the extent to which it measures what it is supposed to measure. It is of interest to examine the Registry Examination with reference to these criteria.

Reliability and Validity of the Registry Examination

The last edition of the objective examination, which has been used since late in 1943, has a split-half corrected reliability of 0.88 for a randomly selected group of 144 students representing all schools. When the homo-

geneity of the group is considered, such a reliability coefficient is high.¹ It compares very favorably with reliabilities found for objective achievement tests developed for use with student groups of much greater heterogeneity. In other words, the last edition of the Registry Examination is a highly reliable instrument.

Measures of validity are more difficult to calculate. If a test correlates well with an outside criterion which itself has high reliability, it is assumed to have validity. If a test differentiates between two groups of individuals, one of which presumably has the trait in question (in this instance, knowledge of physical therapy) and the other one of which does not have the trait, this differentiation itself is another estimate of the validity of a test. If a test is composed of items which competent persons agree are related to a trait (in this instance, knowledge of physical therapy), it is assumed to be valid. In all three instances, reliabilities must, of course, be satisfactory. Reliability of and by itself is no guarantee of validity. The former may exist without the latter. The latter by definition demands the existence of the former.

Careful examination of the Registry Examination for evidence of validity leads to some interesting conclusions—and perhaps to some questions. If grades earned in schools of physical therapy may be considered as outside criteria, the Registry Examination may be assumed to exhibit rather high validity. Hellebrandt² has reported, and her scattergraphs show, relationships between scores on the Registry Examination and grades in basic and medical sciences and average numerical school grades. She has pointed out, however, that such relationships were not found between Registry Examination scores and measures which were used to evaluate knowledge in other subject matter fields or to rate over-all efficiency. Most of these criterial scores were very restricted in range. No correlation coefficients were reported, and there is no way of estimating the reliability of her criteria. The same comments could, of course, be made for any similar data from any other school.

A correlation of 0.68 was found between Registry Examination scores and over-all school grades for the 39 students for which both measures were reported by Hellebrandt.³ When one considers that the ratio between the achievements of highest and lowest students in terms of school grades was approximately 1:1.2, whereas the ratio between highest and lowest students in terms of Registry Examination scores was 1:3.5, it becomes obvious that school grades as traditionally given are probably not as representative of the differences which actually exist among technicians as are more objective measures. This would be anticipated on theoretic grounds and is in line with results of research in related fields. Correlations, therefore, would probably have been considerably higher if the range of school grades had not been artificially restricted.

For 48 students at the Mayo Clinic a correlation of 0.84 was obtained between combined school grades and scores on the Registry examination. For the Mayo Clinic as well as for the WAC group, the range of school grades was restricted and grades were of unknown reliability. The Registry Examination, then, meets satisfactorily the first criterion by which validity is established, subject to limitations which characterize all evaluations of school achievement.

1. The reliability of any test is a function of several variables. One such variable is the type of group being tested; another is the range of scores being assigned, which, in turn, is a function of the length of the test. The more heterogeneous the group being tested, or the larger the "range of talent" the higher the reliability, other things being equal. The reader is referred to any text on psychologic statistics.

2. Hellebrandt, F. A.: Analysis of the WAC Emergency Physical Therapy Training Program, Arch. Phys. Med. 26:502-514 (Aug.) 1945.

3. *Idid.*, p. 513.

It is hoped that in the near future the relationships which exist between scores on the Registry Examination and actual performance on the job can be indicated for a sample group of approximately 200 technicians. This investigation is being carried on at the present time, but, since it requires the cooperation of directors and supervisors of technicians all over the country, it will be some weeks before all data are available. Results will be reported in the ARCHIVES.

I have experimentally pretested 17 physicians who at various times were scheduled to study physical medicine. The Registry Examination was administered before the men had studied in the field. Although these men were competent physicians, 8 earned grades of "E" or "F"; 8 grades of "D—" or "D," and 1, a grade of "C." The average grade for the physicians without training in physical therapy was a "D—." The average grade earned by technicians at the end of their training is close to "C+." Apparently, general knowledge of medicine and experience in its practice did not enable these physicians to "outguess" the Registry Examination. It must, therefore, be assumed that the knowledge called for on the Registry Examination relates to the specific field of physical therapy rather than to the kind of material with which physicians unfamiliar with physical medicine were acquainted. In other words, the Registry Examination meets satisfactorily the second criterion by which validity may be established. It differentiates between two groups of known backgrounds.

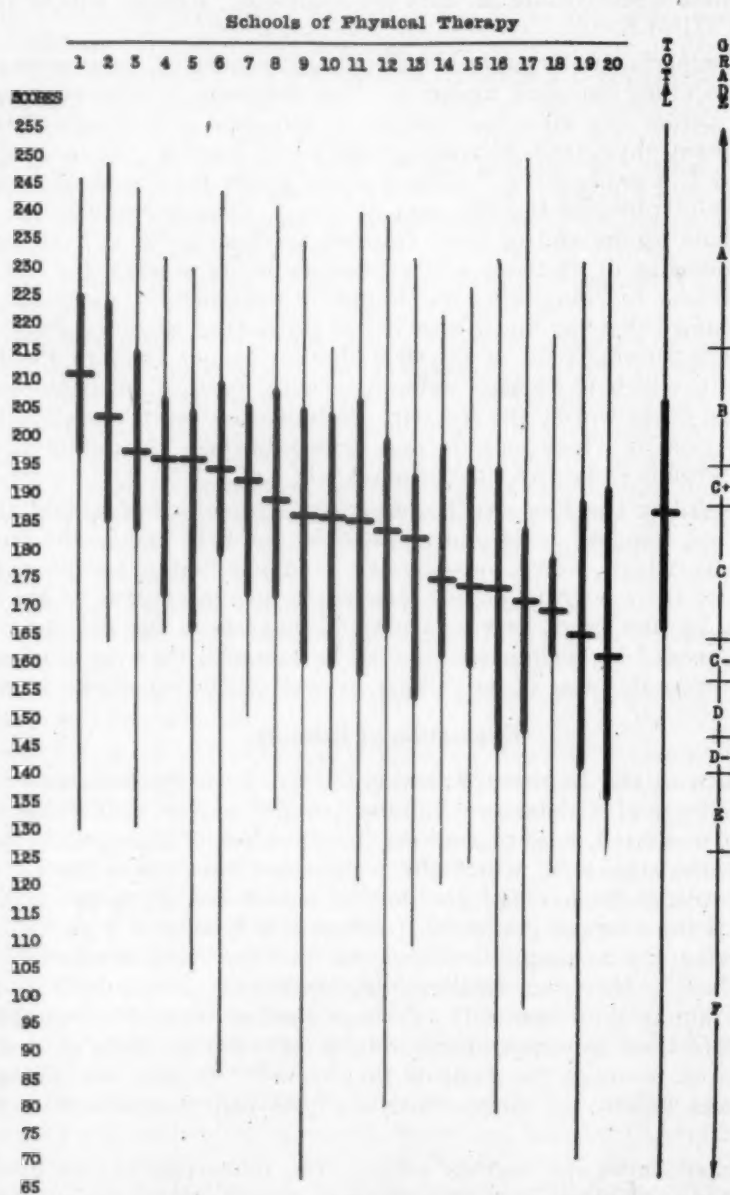
Items used in the Registry Examination sample rather widely the subject matter in standard texts and manuals in the field and in the basic sciences. Items which were controversial were eliminated to the extent of the ability of the writer to do so. Inasmuch as the content of the Examination has, by and large, been conceded by experts in the field to measure knowledge needed by technicians, it may be assumed that the Registry Examination meets this test of its validity as well as the other two mentioned.

Evaluation of Schools

Inasmuch as the Registry Examination has been demonstrated to have high reliability and satisfactory validity, to the extent that these can be judged and measured, it is of interest to ask whether it might be possible to evaluate the schools in which the technicians have taken their training. In other words, if the average graduate of school No. 20 makes a grade of "C—" and if the average graduate of school No. 1 earns a high "B" grade, may one make any assumptions about the quality of the graduates trained by each school? May one, furthermore, make any assumptions about the quality of training they received? Perhaps another way of asking the question is: "Are there any more reliable or more valid methods of evaluating schools than in terms of the students they train?" If there are, perhaps the reliability and validity of these other methods can themselves be demonstrated.

The chart shows for various schools the numerical grades earned by their students. All data, including those in the "Total" column, are based on scores earned by technicians trained prior to May, 1945. No schools are included which between December, 1943 and May, 1945 graduated fewer than 10 students who sought to join the Registry. Schools which were set up in military hospitals are excluded, since these are no longer in operation, although the column "Total" includes grades made for 1,290 students from all schools, including those giving emergency courses. A code number identifies each school. The director of any school will be sent the code number of his school if he requests it.

On the chart, the following data are shown for each school: The median (average) score earned by the graduates of the school is indicated by the short horizontal line. The heavy vertical line shows the range of scores earned by the middle 50 per cent of the graduates. The thin vertical line is extended to cover the upper 25 per cent and the lower 25 per cent of the



scores earned by graduates of the school. The column "Grade" indicates score = grade equivalents. Since the chart shows the entire range of scores for all schools, the impression is obtained that schools are much more alike than actually may be true. On this kind of chart showing a total range of from 67 to 256 points, differences may appear restricted; no attempt has been made to magnify them. It was thought that the advantages of showing complete ranges of scores would outweigh the disadvantages.

(Continued on page 524)

ARCHIVES of PHYSICAL MEDICINE

OFFICIAL PUBLICATION AMERICAN CONGRESS OF PHYSICAL MEDICINE

.. EDITORIALS ..

THE A. M. A. EXHIBITS ON PHYSICAL MEDICINE

Those who enjoyed the privilege of attending the recent annual session of the American Medical Association in San Francisco must have been impressed by the interest shown in the exhibit on physical medicine. This exhibit, organized and directed by a Special Exhibit Committee under the able chairmanship of Dr. Frank Krusen, was the most ambitious effort yet made at an American Medical Association convention to orient the medical profession in the field of physical medicine. The Committee is to be congratulated on the success of the project.

Appearing on page 491 of this issue of the ARCHIVES will be found an outline of the Exhibit on Physical Medicine. It is derived from material presented at the Exhibit and contains the salient facts illustrated in the various sections. The article by Dr. Howard Rusk on page 485, reprinted from the *New York Times*, also presents a very lucid description of the Exhibit. Those who were not able to attend the A. M. A. Convention will find both of these descriptions interesting and instructive.

EARLY MOBILIZATION IN THE POSTOPERATIVE CARE OF SURGICAL PATIENTS

The acceleration in scientific progress during the recent world conflict has been reflected in the medical sciences by a number of important developments. One of these apparently arose from the need for man power and the shortage of hospital beds, namely, early mobilization of surgical patients.

Prolonged bed rest has certain deleterious effects upon the surgical patient. Keys¹ summarized these effects as loss of endurance and postural coordination, reduction in circulatory capacity and efficiency, decrease in circulating blood volume, decrease in cardiac dimensions associated with tachycardia, constipation, negative balance of nitrogen, potassium and calcium. Dock² has called attention again to the fact that long periods of bedrest, often reinforced with sedatives, markedly predispose to phlebothrombosis and pulmonary embolism.

Early mobilization of the surgical patient is not a new idea. Ries³ in 1899 reported the first departure from the standard prolonged bed rest program in the after care in surgical cases. He began by getting his vaginal celiotomy patients out of bed in 24 to 48 hours and out of the hospital in six days. This initial success led him to try a similar program on his patients with abdominal incisions who were allowed to sit up in three days and to be out of bed on the sixth or eighth day. He used no abdominal binders and saw no post-operative hernias.

1. Keys, Ancel: The Physiology of Exercise in Relation to Physical Medicine, Arch. Phys. Med. 26:633 (Oct.) 1945.

2. Dock, Williams: The Evil Sequelae of Complete Bed Rest, J. A. M. A. 125:1083 (Aug. 19) 1944.

3. Ries, Emil: Some Radical Changes in the After Treatment of Celiotomy Cases, J. A. M. A. 33: 454 (Surg. 19) 1899.

In 1907 Boldt⁴ stated that for 15 years he had allowed his vaginal hysterectomy patients out of bed 24 hours after the surgical procedure. Later those with abdominal incisions were supported with an adhesive binder applied in Scultetus fashion and were allowed to sit up in a chair within 24 hours. He reported receiving a letter from Ries in 1906 saying that the latter had now used the "heretical after treatment" in 500 instances with good results. Boldt himself reported 384 cases in which early mobilization had been employed and stated that he had knowledge of a thousand more under the care of other men.

After a visit to the Zurich Clinic, in Germany, Claremont⁵ reported in 1922 that early post-operative mobilization was in use in that Clinic. Patients were out of bed in a chair for thirty minutes twice daily within 24 hours after surgery and began walking the second day. Robertson⁶ announced in 1927 that 90 per cent of his appendectomy patients were ambulatory within 24 hours and were allowed to go home the third day. Many who had had gastroenterostomies and other upper abdominal surgery were able to leave the hospital "fit and well" on the tenth post-operative day.

Powers, in 1941,⁷ discussed the abuse of rest as a therapeutic measure in surgery and Ghormley⁸ pointed out the disadvantages of excessive rest in orthopedics. In Powers' series of 100 cases including hernioplasties, cholecystectomies, and pelvic surgery, the average period of hospitalization for the ambulatory patients was 10.3 days and for the control patients, 16.1 days. The average period of convalescence after surgery in the ambulatory cases was 5.7 weeks and in the controls, 10.3 weeks. There were 17 post-operative complications in the ambulatory group of 100 patients and 46 post-operative complications in a similar group of controls.

Leithauser⁸ three years ago, in a literature review covering 15,000 cases found only 4 instances of fatal pulmonary embolism resulting from early ambulation. This author at the time of publication had performed 900 major surgical procedures with an average of 1.3 days in bed and 4 days in the hospital. There were four deaths.

Nelson⁹ in 1944 announced his employment of early ambulation after 429 abdominal operations. Most of his patients walked within the first twenty-four hours after surgery. There were three wound disruptions, two small incisional hernias, and one death due to cerebral thrombosis.

Elman¹⁰ carried the program of early activity a little further and started his patients on bed exercises immediately after surgery. These consisted of breathing exercises and calisthenics for the upper and lower extremities. His patients were persuaded but not forced to become immediately ambulatory. In 79 patients who were placed on this program, there were no wound disruptions and no pulmonary accidents. In the control group, there were two wound disruptions and three pulmonary embolisms with two deaths. When the ambulatory patients were ready to leave the hospital, they were

4. Boldt, H. J.: The Management of Laparotomy Patients and Their Modified After Treatment, *New York Med. J.* 85:145 (Jan. 26) 1907.

5. Claremont, H. E.: Shortening of Postoperative Convalescence, *Lancet* 1:427 (Mar. 4) 1922.

6. Robertson, George: Short Hospital Convalescence Following Common Abdominal Operations, *Practitioner* 110:162 (Sept.) 1927.

7. Powers, J. H.: The Abuse of Rest as a Therapeutic Measure in Surgery, *J. A. M. A.* 125:1079 (Aug. 19) 1944.

8. Leithauser, D. J.: Confinement to Bed for Only Twenty-four Hours After Operation, *Arch. Surg.* 47:203 (Aug.) 1943.

9. Nelson, Harry: Early Ambulation Following Section the Anterior Abdominal Wall, *Arch. Surg.* 49:1 (July) 1944.

10. Elman, Robert: Physical Medicine in Surgical Convalescence, *Arch. Phys. Med.* 27:197 (April) 1946.

almost completely rehabilitated, while those in the control group after ten days confinement to bed were still weak and poorly prepared to return home.

Taylor, McFarland and Bond¹¹ developed a system of bed exercises for convalescent medical or surgical cases. These should combine well with early ambulation in hastening convalescence.

The attention of the reader is directed to an article in this issue of the ARCHIVES by Major Richard W. Lippman¹² entitled "Medical Implications of Convalescence." This is an interesting presentation of some of the problems of convalescence and rehabilitation and points in the same direction as the material presented in this editorial.

The advantages claimed for the early mobilization program for surgical patients are (1) A lowered incidence of phlebothrombosis and pulmonary embolism; (2) Less nausea, vomiting, and abdominal distention; (3) Early spontaneous bladder and bowel function; (4) Better patient morale and mental status; (5) Earlier rehabilitation and return to work with resulting economic advantage.

It appears to the writer, however, that the ultimate in the use of physical medicine in the care of surgical patients has not yet been reached. In elective cases, this should consist of (1) a preoperative preparation by hydrotherapy and bed exercise training; (2) surgery in an operating room in which the air is treated with ultraviolet radiation; and (3) after care with hydrotherapy, bed exercise and early ambulation. In emergency cases, the period of preparation would have to be eliminated but the rest of the program could be carried out as indicated. It is probable that in some cases other physical procedures such as massage, infra-red radiation, or diathermy might be employed. Physical medicine is demonstrating its usefulness as adjuvant therapy in another branch of medical science.

11. Taylor, G. M.; McFarland, J. W., and Bond, A.: Exercises for the Convalescent Bed Patient, Arch. Phys. Med. 37:82 (Feb.) 1946.

12. Lippman, R. W.: Medical Implications of Convalescence, Arch. Phys. Med. 27:477 (Aug.) 1946.



MEDICAL NEWS

Andrew Ivy Accepts Administrative Post at Illinois

Dr. Andrew C. Ivy, since 1925 Nathan Smith Davis professor of physiology and pharmacology and head of the division of physiology and pharmacology, Northwestern University Medical School, has been appointed vice-president in charge of the Chicago Professional Colleges of the University of Illinois and distinguished professor of physiology in the graduate school, effective September 1. Succeeding Dr. Raymond B. Allen, who recently resigned as executive dean of the Chicago colleges to become president of the University of Washington, September 1, Dr. Ivy will be chief administrator of the university's colleges of medicine, dentistry and pharmacy and its hospitals and institutes. The office of vice-president in charge of the Chicago Professional Colleges is a newly created position, the first vice-presidency in the university organization. During the war he was director of the Naval Medical Research Institute, Bethesda, Md., as well as consultant to the Bureau of Medicine and Surgery of the Navy, the Nutrition Laboratory of the Office of the Surgeon General of the Army and the planning division of the Quartermaster General of the Army.

Pennsylvania Academy of Physical Medicine

At the meeting of the Pennsylvania Academy of Physical Medicine on June 20, 1946, the following officers were elected for the season of 1946-1947.

President—Albert A. Martucci.

Vice-President—George M. Piersol.

Secretary—Harold Lefkoe.

Treasurer—John H. Hennemuth.

The program for the evening consisted of the presentation by Dr. G. J. P. Barger, Washington, D. C., of "The Ultraviolet Irradiation of Blood (With Motion Pictures)."

The Birtcher Scholarship Awards

About a year ago announcement was made of the establishment of the Birtcher Scholarship Fund at the College of Medical Evangelists by the Birtcher Corporation of Los Angeles. Each year awards are made from this fund to sophomore and junior medical students as prizes for the preparation of theses on subjects in the field of physical medicine. The awards for the school year of 1945-46 were announced at the commencement exercises on June 30th.

The subjects suggested by the Birtcher Scholarship Committee for the past school year were: (1) Progress of physical medicine during the past

twenty-five years; (2) Rehabilitation of the war wounded; (3) Cryotherapy.

Thirty theses were presented by sophomore and junior students. The first award of \$250 went to Richard Carter, a junior student, for an essay on "Refrigeration Anesthesia." The second award of \$200 was won by J. Wesley Osborne, also a junior student, for a thesis on "Cryotherapy." Lewis Hart, a sophomore, received the third award of \$150 for his essay on "Rehabilitation of the War Wounded." An exhaustive thesis on "The Progress of Medical Physics During the Past Twenty-five Years" by sophomore William Swatek, won the fourth award of \$100. Honorable mention was accorded J. Warren Olson, Roger Witzel, Louis J. Luddington, Harold Lawson and Victor Hansen, all members of the sophomore class.

Addendum to

Report of Committee on Military Problems

Owing to the rapid turnover of personnel in the Military Service a number of names have been omitted from the lists because of separation from active duty. Military officers have been discharged from the Army and the Navy prior to the preparation of the lists. Only those officers on active duty at the time the lists were made are included in his report. In a few instances the place of assignment was altered either before or after the preparation of the list. The Medical Officers doing Physical Medicine in the Navy was completely omitted by mistake. The following list is presented at this time:

Medical Officers Doing Physical Medicine in the U. S. Navy

Donald Erickson, Lt., U. S. Naval Medical School, Bethesda, Md.

John Gruggle, Comdr., U. S. Naval Hospital, Bethesda, Md.

Howard Fralick, Lt. Comdr., U. S. Naval Hospital, Oakland, California.

Edward Lowman, Comdr., U. S. Naval Hospital, Philadelphia, Pa.

Rodney Chamberlain, Comdr., U. S. Naval Hospital, Corona, California.

Arthur Sewell Wesson

We regret to announce the death at the early age of forty-one, of Dr. Arthur Sewell Wesson, physician in charge of the department of physical therapy at University College Hospital and at the Royal Surrey County Hospital, Guildford. He studied medicine at U. C. H., qualified in 1925, and took the M.B., B.S., London, in 1926 and the M.D. in 1928. He became a Fellow of the Royal College of Surgeons of England in 1936 and was elected a Fellow of the Royal College of Physicians in 1944.

Hospitals Approved for Residency Training in Physical Medicine

- ¹Los Angeles County Hospital, Los Angeles.
- ¹Massachusetts General Hospital, Boston.
- Mayo Foundation, Rochester, Minnesota.
- Michael Reese Hospital, Chicago.
- ¹Montefiore Hospital for Chronic Diseases, New York City.
- ¹Mount Sinai Hospital New York City.
- Passavant Memorial Hospital, Chicago.
- ¹Presbyterian Hospital, New York City.
- St. Luke's Hospital, New York City.
- Stanford University Hospitals, San Francisco.
- ¹State of Wisconsin General Hospital, Madison, Wisconsin.
- ¹University of California Hospital, San Francisco.
- ¹University Hospitals, Minneapolis, Minnesota.
- Walter Reed General Hospital, Washington, D. C.
- University of Kansas Hospital, Kansas City, Kansas.

1. Indicates temporary approval.

Veterans With Spinal Injuries Get Special Beds

Dr. Paul R. Hawley, medical director of the Veterans Administration, reports that war veterans with injured spinal cords will, on their discharge from the hospital, be given special hospital beds with an overhead bar, inner spring mattresses and two mattress covers if their doctors decide they need this special equipment at home. Dr. Hawley explains that his agency anticipates the responsibility of caring for around 2,000 World War II spinal cord injury cases and has worked out an extensive program for their medical rehabilitation. Treatment centers are now at Richmond, Va., New York, Pittsburgh and Van Nuys, Calif.

Gardiner General Hospital Will Be Fifth Army Headquarters

In response to requests for the conversion of the Gardiner General Hospital, Chicago, Illinois, for non-military use Secretary of War Robert P. Patterson announced that it was necessary for the War Department to retain the property as Headquarters for the Fifth Army and Fifth Army Area.

In making the announcement, the Secretary said a thorough survey of other available sites for the Army Headquarters had shown the federally-owned property now occupied by Gardiner Hospital as the most suitable. He added that he had reluctantly turned down a request of the Federal Public Housing Authority to convert the hospital into a housing unit.

Dr. Hellebrandt Visiting Lecturer at Wisconsin

During the first week of the summer session at the University of Wisconsin, Dr. Hellebrandt, of the Baruch Center of Physical Medicine of the

Medical College of Virginia, delivered a series of five lectures entitled "The Physiological Basis of Motor Learning." These were introductory to a graduate course concerned with the analysis of the technic of teaching motor skills. Included in the series was a discussion of "The Anatomical Basis of Motor Learning—Its Architectural Plan," "The Genesis of Overt Behavior," "Emotional Stress as a Dynamogenic Force and as a Disrupter of Skill," "The Overland Principle and the Development of Power" and "Differentiating Psychologic End-Points of Effort."

Graduation at Kansas

Eleven students completed the prescribed 10 months physical therapy course at the University of Kansas. Presentation of certificates to the physical therapists took place on July 15th at the University of Kansas Hospitals. Dr. Lee Ledger of the Medical School Faculty gave a talk on Physical Medicine. The sound motion picture film "Accent on Use" was shown. The certificates were presented by Dr. H. R. Wahl, Dean of the School of Medicine.

The following students received certificates:

- Jean L. Bell, Chetopa, Kansas.
- Margaret Jean Cook, St. Joseph, Mo.
- Audrey Edelen, Strasburg, Colorado.
- Marion Ruth Figley, Kansas City, Kansas.
- Leonore M. Jameyson, Wichita, Kansas.
- Martha Musick, Kansas City, Missouri.
- Fern B. Parker, Harper, Kansas.
- Bonnie Peters, Itica, Kansas.
- Iris Bobette Sellers, Paola, Kansas.
- Ann Glorene Titus, Wichita, Kansas.
- Ruth Wagner, Kansas City, Kansas.

Miss Iris Bobette Sellers and Miss Ann Glorene Titus were members of this class and will be candidates for the degree of Bachelor of Science in Physical Medicine at the conclusion of the present semester.

School Clinic for Spastics

A permanent school clinic for spastics will be opened in September at Lincoln School, Tulsa, under the auspices of the Oklahoma Crippled Children's Commission and with the endorsement of the Tulsa County Medical Society. The proposed school is an outgrowth of certain investigations of the spastic situation in the Tulsa area carried on by the Tulsa council of social agencies and the city schools health department. These two groups are co-sponsors with the Crippled Children's Commission. It is proposed to offer a program of normal education, physical training, physical therapy, occupational rehabilitation or training and specialized medical supervision and treatment. A trained physical therapist will be employed for the school and it is hoped to employ later an occupational therapist. The medical supervision of the clinic is to be under local Tulsa physicians.

BOOK REVIEWS

THE MANAGEMENT OF FRACTURES, DISLOCATIONS, AND SPRAINS. By *John Albert Key, B.S., M.D.*, Clinical Professor of Orthopedic Surgery, Washington University School of Medicine; Associate Surgeon, Barnes, Children's, and Jewish Hospitals, St. Louis, Missouri; and *H. Earle Ccnwell, M.D., F.A.C.S.*, Orthopaedic Surgeon to the Tennessee Coal, Iron and Railroad Company and the American Cast Iron Pipe Company; Chairman of the Committee on Fractures and Traumatic Surgery of the American Academy of Orthopaedic Surgeons; Associate Surgical Director of the Crippled Children's Hospital, Attending Orthopaedic Surgeon to St. Vincent's Hospital, South Highlands Hospital, Jefferson-Hillman Hospital, Children's Hospital and Baptist Hospitals, Birmingham, Alabama. Fourth edition. Cloth. Price, \$10.00. Pp. 1322 with 1316 illustrations. St. Louis: C. V. Mosby Company, 1946.

The new edition of this text on fractures, dislocations and sprains is appropriate and important in view of the increasing interest and advancement in the treatment of traumatic conditions, particularly from the surgical point of view. This text is meant primarily for medical students, general practitioners and surgeons, but should serve also as a reference of value to the specialist in Physical Medicine. The subject is covered rather completely beginning first with chapters discussing fracture equipment and plaster technics and general statements as to pathologic conditions encountered and physiological factors in repair. A chapter on first aid is included, and rightly so. There are also chapters dealing with the Workmen's Compensation Law of value to those treating industrial accidents, and a chapter on the medical-legal aspects. Fractures of specific regions of the body are considered in special sections and contributions are included by specialists in their fields on the subjects of skull and brain trauma and fractures of the jaws and related bones of the face. For the rest of the body, fractures are considered regionally, first with a review of the surgical anatomy, then physical findings, special considerations as to complications where indicated, and then the detailed description of treatment. The sections which have received the principal changes are those on the spine, hips and compound fractures in keeping with recent advances in the field. An important aspect of presentation of the subject of bone disease and trauma is good roentgenographic presentation. This book is fairly profusely illustrated and on the whole the x-rays which form the bulk of the illustrative materials are well selected and reproduced. Specialists in the field of Physical Medicine will be disappointed by the presentation of its role in fracture treatment. On the whole there is warning more against the dangers of its employment

than of its advantages, and when advocated the instructions included are of not sufficient detail to enable a general practitioner to write an intelligent physical medicine prescription. It is unfortunate that a book which is so well written generally and which otherwise could be recommended so wholeheartedly could not contain some material prepared by a specialist in the field of Physical Medicine so that those physicians treating fractures could be properly instructed in its indication and prescription.

A CLASS BOOK OF PRACTICAL EMBRYOLOGY FOR MEDICAL STUDENTS. By *P. N. B. Odgers*, Reader in Human Anatomy, University of Oxford. Paper. Pp. 63, with 27 charts. Price, \$2.00. London, New York, Toronto: Oxford University Press, 1945.

This is a brief laboratory manual for students of embryology which includes clear, diagrammatic drawings of cross-sections of pig embryos of varying stages of development together with accompanying brief descriptions. Confusing detail is omitted in the drawings which are adequately labeled. This should prove to be a valuable aid for medical students in their studies of this subject.

GERMAN FOR THE SCIENTIST (CHEMIST AND PHYSICIST). By *Peter F. Wiener*, Modern Language Master at Rugby School (Formerly Tutor in German in the University of London). With an Introduction by *E. N. da C. Andrade, D.Sc., Ph.D., F.R.S.*, Quain Professor of Physics in the University of London. First American Edition. With Additional Sections and Foreword by *Paul Spoerri, Ph.D.*, Polytechnic Institute of Brooklyn. Cloth. Price, \$3.50. Pp. 238. Brooklyn, N. Y.: Chemical Publishing Co., 1946.

As we read in the introduction "Whatever the future of the German peoples may be, a knowledge of the German language will remain essential for every worker in the scientific field." According to the author the first proofs were almost ready when war broke out in 1939. The publication had to be postponed for obvious reasons. The book is divided into four parts and it is the aim to give to students a reading knowledge of German. Part one gives a brief summary in ten short lessons, in not too difficult a form, of the grammatical and constructional difficulties and the elements of scientific German. In Parts II and III are passages taken from scientific literature arranged in order of difficulty. Part IV gives translations of passages in Part II. To illustrate the carefulness with which the passages have been selected we quote some we think of especial interest to physiatrists: "Wien's displacement

Law"; Nernst's, "The Critical Phenomena"; Andrade, "On the Atomic Theory"; "On Isaac Newton's Opticks"; Max Planck, "Molecular Actions"; Bragg's, "The Analysis of Crystals by the X-Ray Spectrometer"; Hertz, "From the Introduction to 'Electric Waves'." Just to show the reader how gently one is introduced to these passages the translation is started with one of Hans Christian Anderson's delightful fairy tales, "The Little Match Girl." The small volume is enthusiastically recommended for the purpose for which it was published.

CLINICAL LABORATORY DIAGNOSIS. By Samuel A. Levinson, M.S., M.D., Ph.D., Director of Laboratories, Research and Educational Hospitals, Chicago, Ill.; Professor of Pathology, University of Illinois College of Medicine; and Robert P. MacFate, Ch.E., M.S., Ph.D., Assistant Director of Laboratories, Research and Educational Hospitals, Chicago, Illinois; Assistant Professor of Pathology, University of Illinois College of Medicine. Third Edition. Cloth. Price, \$10.00. Pp. 971, with 192 illustrations. Philadelphia: Lea & Febiger, 1946.

This is the third edition of one of the outstanding volumes on clinical laboratory procedures. As in the other editions the correlation of the clinical features with the laboratory observations makes this most useful. The new chapter on tropical diseases is sufficiently comprehensive to be valuable to most practitioners. Other items have been added to bring this work completely up to date. This is a book to be recommended because of its wealth of material which is presented clearly, concisely and practically.

DOCTORS, DRUGS AND STEEL. By Edward Podolsky, M.D. Cloth. Price, \$3.75. Pp. 384, with 19 illustrations. New York: Bernard Ackerman, Inc., 1946.

This is the type of book that should not be sent to a medical man to review. In the first place the sale for or against such a book amongst professional persons is not influenced by the remarks of the reviewer since the book obviously is written only for lay consumption. Secondly a medical man has a regular field day in finding errors and faults. Here are a few examples—"cobra venom is at the present time the best and most effective of drugs to allay the most terrible heart pains"; "the more mentally alert are those who love the sun"; "it (phrenectomy for tuberculosis) is a necessary operation in very desperate cases and is often the only means of saving the patient's life"; "Dr. Bogomolets has done remarkable work with blood transfusion in delaying the onset of old age"; etc., etc. If the authors of books of this type together with those who write articles for the supplements of the Sunday newspaper and that one individual who produces for the Readers' Digest had to answer the questions of the many patients in whom failure and disappointment results from the use of these very methods and drugs which they so glowingly recommend, it might deter them from this scribbling, however even that would not be sufficient retribution.

NEW AND NONOFFICIAL REMEDIES, 1946. CONTAINING DESCRIPTIONS OF THE ARTICLES WHICH STAND ACCEPTED BY THE COUNCIL ON PHARMACY AND CHEMISTRY OF THE AMERICAN MEDICAL ASSOCIATION ON JANUARY 1, 1946. Issued under the Direction and Supervision of the Council on Pharmacy and Chemistry of the American Medical Association. Cloth. Price, \$1.50. Pp. 770. Chicago: American Medical Association, 1946.

This volume needs no introduction to the medical profession. That the new revision is ready for distribution should be of sufficient interest to physicians to make it important to replace their old edition. Attention is called to the fact that the Council recently decided to cease consideration of those official preparations, the actions, uses and nature of which are so well understood by physicians as not to require their inclusion. A list of the brands thus exempted from consideration will be found in the preface.

CHEMISTRY OF FOOD AND NUTRITION. By Henry C. Sherman, Ph.D., Sc.D., Mitchell Professor of Chemistry, Columbia University, New York. Seventh Edition. Cloth. Price, \$3.75. Pp. 675, with 47 illustrations. New York: The Macmillan Company, 1946.

Recent research in the chemistry of nutrition has brought to light many new facts including several discoveries and chemical identifications of previously unknown vitamins. Nutrition has been found to play an important part in the maintenance of the body's reputed "steady states," its relative constant environment. Yet also it is now found that this internal environment is not so rigidly fixed as had been supposed. In order to incorporate the recent advances into this new edition, every chapter has been revised, several of them rewritten, and two new chapters, dealing respectively with the nutritional characteristics of the chief groups of foods, and the causes and extent of variations in the nutritive values of foods have been inserted. While the simplest grouping of foods falls into five classes, there are eleven food groups largely used in the planning and evaluation of dietaries. They are: (1) Grain products; (2) potatoes and sweet potatoes; (3) dry mature beans, peas and nuts; (4) tomatoes and citrus fruits; (5) green and yellow vegetables; (6) other vegetables and fruit; (7) milk and its products other than butter; (8) eggs; (9) lean meat, poultry and fish; (10) fats, including bacon and salt side; (11) sugars, sirups, molasses and preserves. Attention is especially called to this grouping to facilitate the transition of our viewpoint from the more chemical study of foods in terms of their constituents to the more largely economic consideration of foods. The new chapter on variations in nutritive values opens up an interesting amount of new data available. For instance 16 varieties of mature onions showed a variation of from 40 to 17 milligrams of vitamin C per 100 grams. And again the small transfer of bone calcium which occurs in ordinary cooking was found to be multiplied many fold by added vinegar. The physician who keeps trend of mod-

ern advances is today taking more time to learn about foods and well he may if he is willing to review for his own information the latest addition of this recognized authority in field of food and nutrition.

CORNELL CONFERENCES ON THERAPY. Volume I. Edited by *Harry Gold, M.D.*, Managing Editor; *David Barr, M.D.*; *Eugene F. DuBois, M.D.*; *McKeen Cattell, M.D.*, and *Charles H. Wheeler, M.D.* Cloth. Price, \$3.25. Pp. 322. New York: The MacMillan Co., 1946.

There are various ways of learning medicine but one of the best is by means of intelligent discussion. The ever increasing use of round table discussions at the national meetings speaks for their value and popularity. Reading this book is like attending fifteen such sessions. It is a collection of fifteen conferences which have been held at Cornell Medical School and include such items as treatment of heart failure, treatment of intestinal infestations, the doctor's hand bag, treatment of poisoning, use and abuse of bed rest, the Rh factor in therapy, etc. Each chapter covers an hour's time in which various members of the staff and other participants express their opinions and experiences. These chapters have appeared periodically in the *New York State Journal of Medicine* and *The Journal of the American Medical Association*. It is the type of book that is read because it is interesting and stimulating; and instructive without being obvious. A chapter on "digitalis versus digitoxin" would appear to be academic or the chapter on the "treatment of diseases of the eye" would have appeal to an ophthalmologist but the manner of presentation and the practical application of each subject make the book valuable to every physician regardless of his interest.

A HISTORY OF MEDICINE. By *Douglas Guthrie, M.D., F.R.C.S., Ed., F.R.S.E.* With an introduction by *Samuel C. Harvey, M.D., F.A.C.S.*; *Wm. H. Carmalt, Professor of Surgery, Yale University School of Medicine.* Cloth. Price, \$6.00. Pp. 448, with 72 plates. Philadelphia, London, Montreal: J. P. Lippincott Co., 1946.

Many books have appeared on the history of medicine; many which require volumes to relate a definite period of time, others are more given to describing details of evolution of various diseases and disorders, others are concerned with outstanding personalities, while still other works narrate the development of the medical practice and how it has been influenced by the philosophies and cultures of the times but in this relatively

short volume all these factors are considered in a manner which makes it comprehensive and enjoyable. This book is not intended for the professional medical historian but for the physician or scientist who wishes to read a clear and interesting account of medicine from ancient times to the twentieth century. Several of the modalities of physical medicine are considered and the author gives recognition to the men of the earlier centuries who have made contributions to this field.

The reason for this work is not only the pleasure it gives in its reading which is cause enough for its publication but also to broaden the appreciation of the art and science of medicine. This effort of Dr. Guthrie will help the practitioner of today realize the magnitude of his heritage.

AMBULATORY PROCTOLOGY. By *Alfred J. Cantor, M.D.*, Associate Proctologist, Kew Gardens Hospital, Long Island, New York; Formerly Assistant Attending Gastroenterologist, Queens General Hospital, and Assistant Adjunct Proctologist, Hospital for Joint Diseases, New York. With foreword by *Beaumont S. Cornell, M.D.*, Editor, *American Journal of Digestive Diseases.* Cloth. Price, \$8.00. Pp. 524 with 281 illustrations. New York and London: Paul B. Hoeber, Inc., Medical Book Dept. of Harper & Brothers, 1946.

This is a complete presentation of all diseases and disorders affecting anus, rectum and sigmoid. Brief discussions of the diseases of the colon which are often seen by the proctologist are also included. The various subjects are presented systematically and clearly with a minimum of space for controversial points. The author stresses the possibility of treating most of these lesions as an office procedure and hence the title. The treatments include both medical and surgical. The advisability of performing the more radical operations in the office and sending the patients home might be questioned, however, the entire problem of ambulation following surgery has undergone such a marked change in the past decade that any note of conservatism may be considered archaic.

The bibliography after each chapter is complete but one might question the inclusion of 124 references for 10 pages about lymphogranulom venereum. The illustrations are numerous with many line drawings which are satisfactory.

The author apparently is not an advocate of colonic irrigations which is in agreement with many clinicians today; such an opinion a few years ago would have been considered heresy. This is a straight forward, up-to-date book on this subject.

PHYSICAL MEDICINE ABSTRACTS

Artificial Sunlight Treatment in Industry.

Edit. Brit. M. J. 4457:882 (June 8) 1946.

It is claimed that this treatment lessens the incidence of sickness and accidents, reduces absenteeism, hastens recovery from illness and injury and increases production.

A large-scale and controlled inquiry was planned and carried out "to ascertain in a scientifically controlled experiment whether the collective irradiation of workers by ultraviolet light from quartz mercury arc lamps, using a minimum perceptible erythema dose, will reduce their rates of sickness absence and the duration of their colds."

The results do not confirm the claim that the commonly accepted technic is effective in reducing sickness and accident incidence and increasing efficiency. Those chosen for the trials had every opportunity of benefiting from the treatment, because half the clerical workers, many of the factory workers, and all the underground workers at the colliery spent the whole of their working time in artificial light. In none of these communities was the average amount of sickness absence found to be significantly less among those who had ultraviolet light treatment than among those who were exposed only to the screened lamps. In the two communities in which the duration of colds was studied, and in the colliery where injury and total absence were measured, the three treated groups did not differ significantly. Nor did any of the communities show any evidence, in the characteristics measured, of a vitamin D deficiency. A third of the people treated stated that their health had been better during their attendance for treatment, but there was no evidence that this benefit was due to the shorter rays, since the numbers were almost equally distributed in the treated groups. The treated groups in the colliery, those receiving and those not receiving the shorter ultraviolet rays, had a significant advantage over the untreated controls in respect of sickness and total absence, but it was not possible to select at random the untreated group whose health in the previous year, when there was no sunlight treatment, was found to be less good than that of the treated men. In the office and factory those given no treatment at all showed fewer days with colds than those who were treated. This result probably has no significance, but was due to a greater accuracy in the records of those who attended the clinics.

The results of this investigation "debunk" some of the claims made by manufacturers and doctors for using a particular type of artificial sunlight as a tonic to prevent absence from work, but they provide no evidence as to the value of ultraviolet light for treating particular diseases, other than perhaps the common cold. A negative result such

as this may be less satisfactory to the research worker than a positive one, but this inquiry will have been fully justified if it serves to illustrate both the method of and the difficulties inherent in carrying out such a carefully controlled and large-scale trial in an industrial population.

Newer Concepts in the Treatment of the Paralyzed Patient Due to War-Time Injuries of the Spine.

Charles W. Elkins, and Walter R. Wegner.

Ann. Surg. 123:516 (April) 1946.

During the past year and a half the author observed a series of 77 cases with war injuries of the spinal cord resulting in either complete or partial paralysis of one or more extremities and varying degrees of bladder and bowel dysfunction. The conclusions are drawn that the most frequent neurosurgical complications in this type of patient are retained foreign bodies in close proximity to the spinal cord or peripheral nerve roots, intractable pain and uncontrolled spinal reflexes.

It seems best to follow a conservative course in treating these spastic conditions because of the hope of spontaneous remission. This has been noted in total transections as well as in partial lesions. The treatment during this period should consist of splinting, physical therapy and any other simple method that particular circumstances indicate.

Unfortunately, skin traction can seldom be employed because of the danger of pressure sores when such traction is used on partially or completely anesthetic skin. In one severe case with an incomplete lesion and beginning contractures the Kirschner wire traction was used and although it served the purpose, the frequent spastic jerking of the leg caused considerable pain at the site of the wire. With flexion reflexes one must guard against contractures at the hip as well as at the knee. It has been helpful to have the patient lie on his abdomen a part of each day, with legs held flat by a folded sheet tied beneath the bed.

Curare was given intramuscularly in doses starting at 1.0 mg. per kilo of body weight and increasing gradually to almost 3.0 mg. per kilo. The results were not striking and the only conclusion to be reached is that the brief and moderate improvement in spasticity produced by the curare is hardly useful except as an adjunct to other therapy, such as splinting, traction and passive exercise.

Electrotherapy of Cerebral Thrombosis.

Corres. Brit. M. J. 4453:748 (May 11) 1946.

Q. I recently read that hemiplegia due to cerebral thrombosis may be treated by applying a

constant galvanic current to the skull over the affected side and to the cervical sympathetic on the same side, the rationale being that the constant current causes vasodilatation of the cerebral vessels. Surely stimulation of the cervical sympathetic causes vasoconstriction and section vasodilatation. Has this treatment been tested by others?

A. I do not know of any literature dealing with this point. The rationale of the "treatment" is far from convincing. Even if dilatation of the intracranial arteries were produced there is no certainty that the area of cerebral softening would be reduced by such a process.

The "Ionization" of Penicillin. J. L. Hamilton-Paterson.

Brit. M. J. 4452:680 (May 4) 1946.

The practice of using solutions of penicillin for the treatment of infected wounds by ion transfer seems to be on the increase for eye infections. Before these results can be accepted it must be shown that penicillin in solution behaves as an electrolyte. A series of experiments was therefore designed to test this hypothesis, and the results suggest that it is untenable. No attempt was made to determine the specific conductivity of penicillin in solution, but it seems clear that, even if the molecule does move, the rate will be so slow that a therapeutic concentration in the tissues will not be obtained, and there is a possibility that the penicillin will be destroyed by the products of electrolysis of other electrolytes present. The presence of the products of electrolysis of sodium chloride in the *in vitro* experiments led to the rapid destruction of penicillin. It is not known how far this observation can be applied to *in vivo* methods.

Psoriasis: Therapeutic Review. I. L. Schonberg.
Ohio State M. J. 42:254 (March) 1946.

Schonberg observed 207 cases of psoriasis among 7,000 dermatologic cases in a military hospital. In 35 of the patients the psoriasis was of such severity that hospitalization seemed advisable. Two of the patients had psoriasis guttata, whereas all the others had psoriasis vulgaris. The author gained the impression that the various types of parenteral and enteral medication were of no apparent value in this series of cases. Exacerbations were most prevalent where infiltrated patches remained. Dietary measures were of questionable value. Autohemotherapy seemed to benefit only the acute cases of psoriasis guttata. Genital and intertriginous, nail and scalp lesions were most resistant to therapy. Nail lesions did not respond to any measures. Although there was some evidence of familial tendency in several of the cases, no definite conclusions could be drawn. The best method of therapy is external. A soap suds soak and keratolytic preparations were employed for the first few days of treatment. This was followed by a 5 per cent crude coal tar ointment in conjunction with ultraviolet, as suggested

by Goeckerman. Residual lesions were treated with 1 to 3 per cent chrysarobin and ultraviolet. Certain cases of psoriasis will not be influenced by therapy of any kind.

Long Range Insurance for All General Hospitals—The Department of Physical Medicine. Jessie Wright.

Hospitals 20:52 (June) 1946.

The average general hospital of 50 or more beds may add to its efficiency in caring for patients and decrease operating expenses by establishing a department of physical medicine. Too many hospital administrators and staffs have the mistaken idea that an imposing outlay of expensive equipment is necessary before a department for physical treatment may be planned.

In a small hospital the best initial investment is a registered physical therapist who may start in a small department advantageously located.

The prescription should be specific in limiting time of treatment by designating "daily for six days" or for an outpatient "three times a week for three weeks" or whatever the physician wishes. This plan sets a time for the patient to report to his attending physician unless the physician is seeing him on daily hospital rounds.

An approved department for physical therapy, reconditioning, and occupational therapy needs medical direction by someone who has made a special study of this field and has a keen interest in current advances in diagnostic procedures and treatment. The physician directing the department of physical medicine should be responsible for keeping members of the hospital staff up-to-date on the prescription for physical therapy. He should be available for consultation on subsequent related reconditioning, occupational and work therapy as needed and adapted to the individual patient for rehabilitation.

A department of physical medicine will differ in requirements for staff and equipment according to the community the institution serves.

The Peripheral Blood Flow and Rectal and Skin Temperatures in Hypertension. Harold J. Stewart; Willis F. Evans; Helen S. Haskell, and Halla Brown.

Am. Heart J. 31:617 (May) 1946.

The peripheral blood flow and average skin and rectal temperatures have been measured under basal conditions in 56 patients suffering from arterial hypertension. A modification of the method of Hardy and Soderstrom was used. Observations were made at an environmental temperature of 27 C. and 50 per cent humidity.

The average peripheral blood flow for the group is slightly decreased as compared with normal subjects, but the difference does not appear to be statistically significant; the range is essentially the same as in normal subjects. The rectal temperature is higher than in normal subjects, the temperature being over 37 C. in most hypertensive

subjects and under 37 C. in the normal control group. The average weighted skin temperature is lower than that in normal subjects, but the difference is not significant statistically. In hypertensive patients the temperature is higher than normal in the upper part of the body, is near the normal level in the middle part of the body, and is cooler than normal in the lower part, especially in the feet. There were no significant differences between the peripheral blood flow or rectal or skin temperatures of the men and those of the women with hypertension.

The level of the peripheral blood flow is unrelated to the level of the systolic or diastolic blood pressure in individual patients, and a linear correlation between peripheral blood flow and blood pressure level was not apparent. In these patients with hypertension there was a linear correlation between the level of peripheral blood flow and the average weighted skin temperature, in that the higher the skin temperature the higher the peripheral blood flow. The basal metabolic rate in hypertensive patients is within the normal range. The hypertension of patients observed in this study exhibits different characteristics from those prevailing in coarctation of the aorta and in pheochromocytoma, in which the local skin temperatures are, respectively, warmer and cooler than normal.

Some Anatomical Factors Affecting the Stabilizing Functions of Muscles. M. A. MacConaill.

Irish J. M. Sc. 245:160 (May) 1946.

The action of a muscle on a joint is not independent of the attachment from which it pulls upon the moving bone. Muscles which are prime movers when acting from their anatomical origins are joint stabilizers when acting from their anatomical insertions, and conversely. The fibrous tendon sheaths and the lumbrical and interosseus muscles are joint-stabilizing mechanisms.

Progress in the Treatment of Syphilis.

Edit. Brit. M. J. 4454:766 (May 18) 1946.

The relative value of malaria therapy and of artificial fever for neurosyphilis has been explored. In 1940 a committee reported on 1,100 parietic patients treated with malaria and on 320 treated with artificial fever. The results showed that about half the mild cases had remissions, whether they were treated with malaria or with artificial fever. Of severe cases, however, only 1 per cent had remissions after malarial therapy, while 11 per cent had remissions after artificial fever. Attempts have also been made to apply a combination of mapharside and artificial fever to patients with neurosyphilis and also to patients with early syphilis, the objective being a treatment intended to effect a cure in one day. This consisted in an initial dose of bismuth salicylate (0.25 g.) and then a 10-hour period of artificial fever at 106 F. (41 C.) (rectal temperature). During the first 7 hours of the fever 0.24 g. mapharside was given by intravenous drip. None of these attempts has been rewarded by much success.

Health Resort Therapy in Gastrointestinal Disorders. Samuel Weiss.

J. A. M. A. 131:394 (June 1) 1946.

Spa therapy must be considered as an adjunct to, and not a substitute for, individualized management of digestive disorders. It is not indicated in every case, and it cannot replace the medication and other remedial procedures adapted to the needs of each patient. A month at a spa, no matter how beneficial, is no safeguard against the return of ailments which are due to somatic changes and for which uncorrected habits of life may be responsible. These facts should be made clear to every patient, so that he may know that his future cooperation is indispensable to the maintenance of health. American health resorts, properly equipped and efficiently managed, with competent medical supervision of spa therapy, have an important place in the management of digestive disorders. American spas should stand in the same repute and enjoy the same wide popularity which continental spas have attained.

Curare in the Treatment of Acute Poliomyelitis. Max J. Fox.

J. A. M. A. 131:278 (May 25) 1946.

Medical science as yet has found no specific therapy for the treatment of poliomyelitis. Many drugs have been used in the attempt to aid convalescence, but only a few have proved to be of any value in supportive treatment. For the time being, hot fomentations and early muscle re-education seem to be the procedures of choice. This method of treatment is based on the assumption that the disease is self limited and that these procedures in therapy will bring about maximum return of function in the infected person. Since no specific serum or chemotherapy is available, it is quite evident that this disease will run its course from day to day despite the many known therapeutic measures which might be undertaken. With this premise in mind, the available therapy must be thought of purely as a means of abating the illness and of preventing the development of deformities, subluxations and residual spasms.

In his conclusions the author states that curare has been tried in 34 cases of poliomyelitis. Although a few of the patients noted subjective improvement, the observations, objectively, were not encouraging. Bulbar cases did not respond to the treatment, and in 2 cases a rapid downward course necessitated the use of artificial respirators. Curare may be in some instances of temporary benefit, but it is a dangerous drug and is not to be encouraged for the treatment of the acute phase of poliomyelitis.

Blood Circulation of Prominent Athletes. Current Comment.

J. A. M. A. 130:1019 (April 13) 1946.

Arne Andersson and Gunder Hagg, both holders of world's records in long distance running, were subjected to detailed examination of the circulation. Gunder Hagg is a 24 year old Swede

who has broken seven world's records for various distances from 1,500 meters to 5,000 meters. Arne Andersson was a rival and practically equally great runner, who disputed with Hagg principally in the summer of 1944. Nylin's report of the investigations indicated that both could be considered healthy and without any defect whatever from the clinical point of view. Both exhibited a high stroke volume and a somewhat greater heart volume at rest, which resulted in a normal index of heart volume over stroke volume of 10.8 for Hagg and 10.2 for Andersson. Hagg's examination revealed an elastic heart which reacted with decrease in volume in Valsalva's experiments, an extreme respiratory arrhythmia after heavy work and remarkably normal oxygen after heavy work. In Andersson's case the blood pressure rose to remarkably high levels with heavy work and the heart rate to a maximum of 198 beats per minute.

Physical Reconditioning After Rheumatic Fever.
Peter V. Karpovich; Merritt P. Starr; Robert W. Kimbro; Charles G. Stoll, and Raymond A. Weiss.

J. A. M. A. 130:1198 (April 27) 1946.

The purpose in the present study was to apply certain physical fitness tests to the patients convalescing from rheumatic fever in order to determine (a) how soon after clinical subsidence of the disease a patient can safely participate in physical training and (b) how much time is

required in order to regain the degree of physical fitness necessary for limited and full military duty.

As a matter of precaution regarding the possible untoward effect of exercises, it was decided to test the patient's erythrocyte sedimentation rate twenty-four hours after each physical fitness test. This was done because a previous investigation showed that after strenuous muscular work the erythrocyte sedimentation rate should return to normal within twenty-four hours.

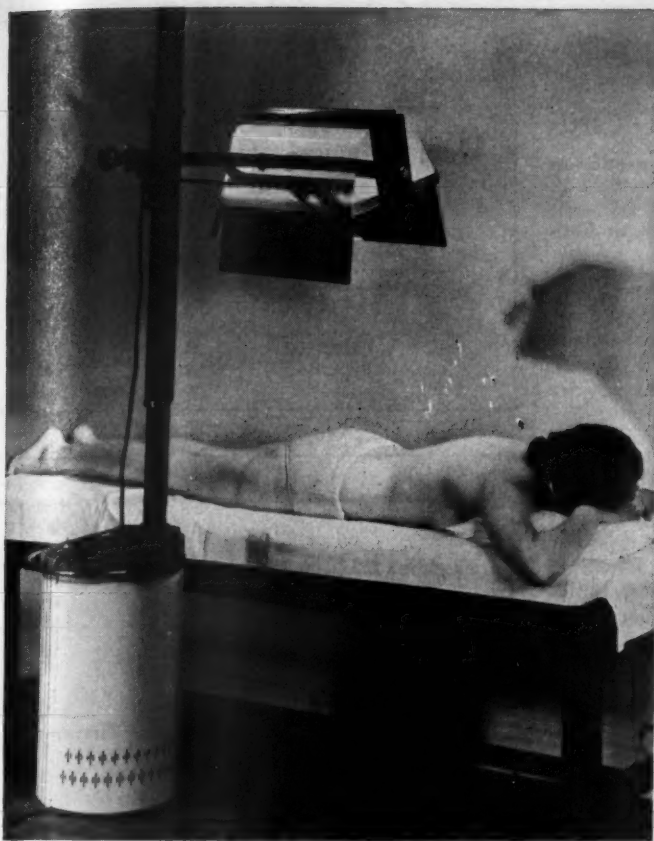
Study was conducted on 88 men convalescing from rheumatic fever in an AAF hospital. Patients participated in a graded program of physical training. The time of beginning and intensification of training were controlled by a series of physical fitness tests. It was found that these tests constituted a simple and safe method of control over physical reconditioning of the patients and furnished objective data when a patient was brought before the Disposition Board for discharge from the hospital. It was found that patients convalescing from rheumatic fever could safely participate in a graded system of physical exercises within two weeks after clinical cessation of the pathologic rheumatic activity. The conventional delay in the beginning of physical reconditioning was reduced from 77.3 days to 16.2 days without causing an increase in the incidence of cardiac damage during six to twelve months of observation. There was no relation between the abnormal erythrocyte sedimentation rate area during the disease and the time necessary to obtain a "fair" score on the progressive test.

THE REGISTRY EXAMINATION—GERKEN

(Continued from page 512)

It is difficult, of course, to account for the fact that 15 per cent of the graduates of each of two schools earned grades below passing while at another school no graduate earned a grade below "C." As difficult to explain is the fact that the middle half of the graduates of one school earned scores in the "B" and "A" range while the middle 50 per cent trained at another school graduating almost as many students range from "D—" to "C+." Perhaps the best conclusions that can be made are obvious ones which are not explanations at all—that students differ before they enroll for their training, that the quality of training provided by the schools varies greatly and that the students themselves differ perhaps more widely after they have completed their training than they did when they started.

It is hoped that the results of the aptitude test research now approaching completion will enable interested schools to choose their students on better bases than have been available previously. Although selection will never be perfect, it can be improved. Standardization of curriculums, development of standardized achievement examinations in the various fields and perhaps more reliable and valid methods for evaluating the different schools may partially equate the training available at these schools. If the latter is a desirable objective, the means for achieving it can doubtless be developed.



THE

Burdick

QA
450-N

ULTRAVIOLET LAMP

- First degree erythema over entire body in 30 seconds at 30 inches (average).
- Full hot quartz spectrum.
- Easily mobile. Fully adjustable.
- Maximum operating convenience.

ULTRAVIOLET---of Widening Usefulness and Established Value

INDICATIONS:

Calcium - phosphorus deficiency diseases
Certain skin conditions
Slow healing and infected surface lesions
Postoperative surgical care
Pregnancy
Tonic — Stimulant — Alterative

A leading authority recently listed nearly 200 applications for ultraviolet irradiation. Among its effects may be mentioned: Activation of sterols potentiating calcium-phosphorus metabolism; improvement in skin texture and muscle tone; increased cellular activity, metabolism, leucocytosis; destruction of bacteria on contact; more rapid healing of certain burns, slow-healing wounds and indolent ulcers; more rapid recovery after surgery; tonic and stimulant effect; enhanced feeling of well-being.

The Burdick QA-450-N Ultraviolet Lamp meets the demands of all major applications of hot quartz type equipment.

The BURDICK CORPORATION
MILTON, WISCONSIN

MEETINGS OF INTEREST TO THOSE IN THE FIELD OF PHYSICAL MEDICINE

In these columns will be published information about meetings of interest to those in the field of physical medicine. New data should be sent promptly to the office of the Secretary, 2 E. 88th St., New York 28, N. Y.

American Congress of Physical Medicine, 24th Annual Session, Hotel Pennsylvania, New York, September 4, 5, 6 and 7, 1946; **Instruction Seminar** to be held during the meeting; Dr. Richard Kovács, 2 East 88th Street, New York 28, Secretary. See announcement elsewhere this issue.

New York Society of Physical Medicine; meetings on first Wednesday, from October to May, New York City; Dr. Madge C. L. McGuinness, 51 East 87th Street, New York 28, Secretary.

The Pennsylvania Academy of Physical Medicine; meetings at the Philadelphia County Medical Building, 21st and Spruce Streets. For 1946 schedule inquire of Secretary, Dr. Harold Lefkoe, 1824 Spruce Street, Philadelphia 3.

Southern California Society of Physical Medicine, Secretary-Treasurer, Dr. Clarence Dail, 802 Acacia Street, San Gabriel, Calif.

American Occupational Therapy Association, Congress Hotel, Chicago, August 11 to 15, 1946. Mrs. Meta R. Cobb, Executive Secretary, 33 West 42nd Street, New York 18, N. Y.

WANTED:

**Male Physical Therapist for old
established industrial office,
200 Republic Building,
Cleveland 15, Ohio.**

WANTED: FEMALE PHYSICAL THERAPIST

Reply to Box 446

**American Registry of Physical Therapy
Technicians**

30 No. Michigan Ave., Chicago 2, Ill.

BRITISH JOURNAL OF PHYSICAL MEDICINE & INDUSTRIAL HYGIENE

PHYSICAL MEDICINE: Articles by medical, orthopaedic and scientific specialists on the theory and practice of physical medicine, including electro-therapy, hydrotherapy, mechanotherapy, climatotherapy; clinical studies of the disorders in which these methods are applied and of convalescence and rehabilitation.

INDUSTRIAL MEDICINE: Articles on the causation, treatment and prevention of industrial disease and injuries, by industrial medical officers and other medical authorities.

Published every other month.

Full particulars of subscription rates, etc., from the Publishers—

BUTTERWORTH & CO. (PUBLISHERS) LTD.

BELL YARD

TEMPLE BAR

LONDON, W.C.2

HOTEL RATES

American Congress of Physical Medicine

September 3, 4, 5, 6, 7, 1946

Hotel Pennsylvania New York City

Unless requested otherwise, we will hold your reservation until 9 p. m. of the day of your arrival.

Date Arriving.....	Hour.....	A. M. P. M.
Room and Bath	3.85 <input type="checkbox"/>	5.50 <input type="checkbox"/>
for One	4.40 <input type="checkbox"/>	6.05 <input type="checkbox"/>
Per Day	4.95 <input type="checkbox"/>	6.60 <input type="checkbox"/>
Double-Bed Room	5.50 <input type="checkbox"/>	7.15 <input type="checkbox"/>
with Bath	6.05 <input type="checkbox"/>	7.70 <input type="checkbox"/>
For Two—Per Day	6.60 <input type="checkbox"/>	8.25 <input type="checkbox"/>
Twin-Bed Room		7.70 <input type="checkbox"/>
with Bath	6.50 <input type="checkbox"/>	8.25 <input type="checkbox"/>
For Two—Per Day	7.15 <input type="checkbox"/>	8.80 <input type="checkbox"/>
SUITE—		11.00 <input type="checkbox"/>
Living Room, Bed Room and Bath	10.00 <input type="checkbox"/>	13.00 <input type="checkbox"/>

MORE THAN 2 PERSONS IN 1 ROOM
For each additional person in Double or Twin-Bed Room the extra charge is \$2.00 per day.

If a room at the rate requested is unavailable, reservation will be made at the next rate.

L. B. MURDOCK

Editorial Service

▼

A Complete Service for Medical Authors

▼

Manuscripts prepared for publication and supervised through the press; translations made; abstracts prepared.

▼

Special Attention to Theses

▼

For information address

L. B. MURDOCK
7070 North Clark Street
CHICAGO 26, ILLINOIS

APPLICATION FOR INSTRUCTION SEMINAR

In Conjunction with the
Twenty-Fourth Annual Scientific and Clinical Session

of the

**AMERICAN CONGRESS OF
PHYSICAL MEDICINE**

September 4, 5, 6, 7, 1946

Hotel Pennsylvania, New York City

Name
(Print)

Address

(If physician, answer)
Are you a member of the A. M. A.?.....Are you

a member of your county medical society?.....

Give name of Co. Med. Soc.

(If technician, answer)
Only members of the American Registry of Physical Therapy Technicians are eligible to attend the Seminar. Give Registration Serial Number.....

After reading the general information and schedule of lectures offered, make up the schedule you wish to take, listing lectures by hour and day; watch, please not to duplicate:

.....
Signature in ink.

Date.....

For Schedule of Lectures See Page 470

Please make check payable to and mail it with your application to

American Congress of Physical Medicine
30 North Michigan Avenue Chicago 2, Illinois

OFFICIAL INSIGNIA

THE AMERICAN REGISTRY OF PHYSICAL THERAPY TECHNICIANS



The PIN

(About Actual Size)

The official pin is made of 1/10 carat gold with purple enamel trim.

\$4.20

(Including Federal Tax)

The EMBLEM

(Two-thirds Size)

Gold and purple on white cloth. Color fast. Each,

15c

The pin or the emblem may be obtained with "S" (Senior) or "J" (Junior). Cost must accompany order.
(Prices subject to change without notice.)

Address all communications to
**AMERICAN REGISTRY OF PHYSICAL
THERAPY TECHNICIANS**

30 North Michigan Avenue

Chicago 2



**No other medical periodical gives you such
"wide coverage" in the field of physical medicine
as THE ARCHIVES**

If you are a teacher in physical medicine, a research worker, a physicist, or just a clinician—if you want to stay abreast of all that is new in physical medicine—you must read **THE ARCHIVES**

Each month you will find in this journal informative articles, constructive editorials, physical medicine news, announcement of new books and a wealth of abstracted material dealing with every phase of physical medicine.

If you are not a subscriber to **THE ARCHIVES**—send in your subscription today. Sample copy will be sent on request. Subscription price \$5 per year; Foreign \$6.50.

**AMERICAN CONGRESS OF PHYSICAL MEDICINE,
30 No. Michigan Ave., Chicago 2.**

Please find enclosed check for \$5 ☐ or bill me ☐
for one year's subscription to the **ARCHIVES**.

Name.....

Address.....

City and State.....

Wherever **ELECTROSURGERY IS DONE**



Standard for electrosurgery the world over, Bovie Units are available in models to suit every need and every purse.

For office techniques, the Portable Bovie affords the same essential advantages as the large hospital model in major surgery.

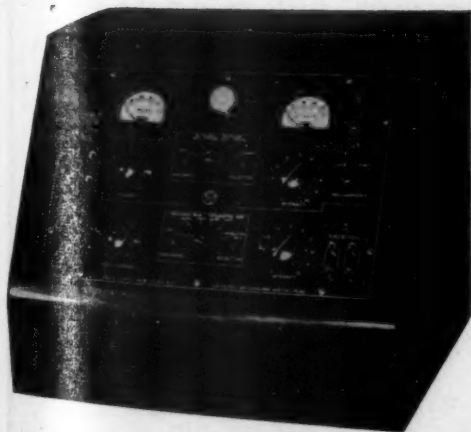
Write for details about this low-priced genuine Bovie Unit.

THE LIEBEL-FLARSHEIM COMPANY

303 WEST THIRD STREET CINCINNATI 2, OHIO



TECA GENERATOR SP3 *for* **LOW-VOLT THERAPY**



This Teca Unit delivers currents of high quality for muscular stimulation, muscle and nerve testing, ion-transfer therapy, galvanosurgery, and all applications where low-volt therapy is indicated.

Write for Detailed Information

TECA CORPORATION, 220 W. 42d STREET, NEW YORK 18, N. Y.

GEORGIA WARM SPRINGS FOUNDATION THREE MONTHS GRADUATE COURSE

PHYSICAL THERAPY IN THE CARE OF POLIOMYELITIS

This course is open to graduates of courses in physical therapy approved by the Council of Medical Education and Hospitals of the American Medical Association and members of the American Physiotherapy Association and/or American Registry of Physical Therapy Technicians.

TUITION: None. For Scholarship, contact the Georgia Warm Springs Foundation or American Physiotherapy Association.

ENTRANCE DATES: First Monday of January, April and October.

PURPOSE OF COURSE: To train qualified physical therapists in the care of all phases of poliomyelitis:

1. Accurate Muscle Strength Evaluation.
2. Body Mechanics.
3. Muscle Reeducation, Including Underwater Exercises.
4. Correct Use of Assistive and Supportive Apparatus.
5. Walking Reeducation.

For Information Write:

ROBERT L. BENNETT, M.D.
Georgia Warm Springs Foundation
Warm Springs, Georgia



PROVIDES all types of applications. Permits use of all types of electrodes. A powerful unit with accurate controls to assure adequate results. Precision construction throughout. Steel cabinet cuts off radiation. Backed by the strong FISCHER guarantee.

Built for SUPERIOR SHORT WAVE Service

THIS FISCHER short wave apparatus is not just another short wave unit. It is the highest quality apparatus that can be built. It will give you long years of superior service. Operates within the wave bands allocated by the Federal Communications Commission. Recommended to physicians, hospitals, clinics, universities and other medical organizations wanting finest performance.

Physicians desiring quality short wave diathermy facilities will find this FISCHER "FCW" Short Wave Apparatus measuring in every way up to strict FISCHER standards. Write for large, 2-color folder giving full instruction.



H. G. FISCHER & CO.
2323-2345 Wabansia Avenue
CHICAGO 47, ILLINOIS

E & J RESUSCITATOR INHALATOR AND ASPIRATOR

The automatic breathing machine for the treatment of respiratory failure in adults, children or the new-born.

Employed in more than 1,000 clinics and many important industrials and first aid organizations.

E & J MANUFACTURING COMPANY

Glendale, California

Drexel Building, 581 Boylston Street,
Philadelphia Boston, Mass.

4448 West Washington Blvd.,
Chicago 24, Ill.

OPPORTUNITIES

WANTED—PHYSICAL THERAPISTS FOR THE FOLLOWING: (a) To head new department in one of the most important hospitals of northern California; registered technician required; base salary \$200 plus \$50 making total salary \$250; bonus of month's salary after six months' service; payable twice annually; in addition, 4% increases annually until base pay increases 20%; interesting retirement plan. (b) To join staff of department recently opened for operation in large teaching hospital located in university medical center of the West; department directed by physician. (c) To take charge of recently established physical therapy department in Puerto Rico; preferably someone with working knowledge of Spanish; traveling expenses paid. (d) Chief physical therapist and three assistant physical therapists; large teaching hospital, eastern metropolis; salary for chief \$2400-\$2800; assistants' salaries range from \$2200-\$2600. (e) Physical therapist to take charge of department in new hospital now being completed and which will be open for operation in September; preferably someone who can report immediately; \$3300, including board and laundry; living accommodations available in one, two or three bedroom apartments at nominal rentals; Alaska.

For further information, please write,

BURNEICE LARSON, Director, Medical Bureau,
Palmolive Building, Chicago 11.

Wherever **ELECTROSURGERY IS DONE**



Standard for electrosurgery the world over, Bovie Units are available in models to suit every need and every purse.

For office techniques, the Portable Bovie affords the same essential advantages as the large hospital model in major surgery.

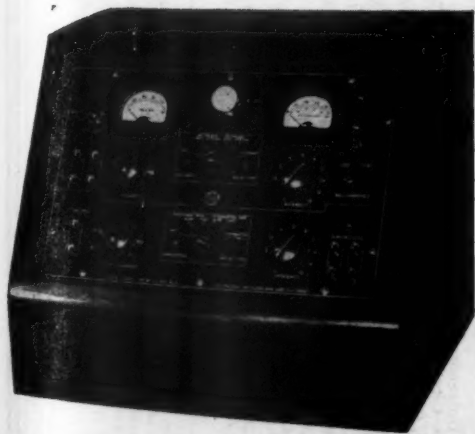
Write for details about this low-priced genuine Bovie Unit.

THE LIEBEL-FLARSHEIM COMPANY

303 WEST THIRD STREET CINCINNATI 2, OHIO



TECA GENERATOR SP3 *for* **LOW-VOLT THERAPY**



This Teca Unit delivers currents of high quality for muscular stimulation, muscle and nerve testing, ion-transfer therapy, galvanosurgery, and all applications where low-volt therapy is indicated.

Write for Detailed Information

TECA CORPORATION, 220 W. 42d STREET, NEW YORK 18, N. Y.

APPROVED SCHOOLS FOR PHYSICAL THERAPY TECHNICIANS ‡ Council on Medical Education and Hospitals of the American Medical Association

Name and Location of School	Medical Director	Technical Director	Entrance Requirements*	Duration of Course	Time of Admission	Maximum Enrollment	Tuition	Certificate, Diploma, Degree
Children's Hospital, Los Angeles ¹	Samuel Mathews, M.D.	Miss Lily Graham	a-b-c	14 mos.	Sept	14	\$200	Diploma
College of Medical Evangelists, Los Angeles ¹	Fred B. Moor, M.D.	A. H. Carlson	a-b-c-d	12 mos.	Sept	20	\$225	Cert. or Dipl.
University of California Hospital, San Francisco ¹	Frances Baker, M.D.	Miss Margery L. Wagner	a-b-c	12 mos.	March/Sept	10	\$150	Certificate
Stanford University, Stanford University, Calif. ¹	W. H. Northway, M.D.	Miss Lucille Daniels	a-b-d	10 mos.	Quarterly	16	\$409	Cert. or Degree
Northwestern University Medical School, Chicago.....	John S. Coulter, M.D.	Miss Gertrude Beard	a-b-d	12 mos.	July/Oct	16	\$300	Certificate
State University of Iowa Medical School, Iowa City....	W. D. Paul, M.D.	Miss Olive C. Farr	f	12 mos.	Sept	---	\$200	**
University of Kansas School of Medicine, Kansas City ¹	G. M. Martin, M.D.	Miss Ruth G. Monteith	a-b-c ²	12 mos.	Feb/Sept	20	\$ 50 ³	Cert. or Degree
Bouvé-Boston School of Physical Education, Boston....	Arthur L. Watkins, M.D.	Miss Constance K. Greene	c ¹	10 mos.	Sept	15	\$250 ³	Cert. or Degree
Boston University, College of Physical Education for Women, Sargent College, Cambridge, Mass.....	Louis Howard M.D.	Miss Adelaide L. McGarrett	H.S.	4 yrs.	Sept	20	Varies	Cert. or Degree
University of Minnesota, Minneapolis ¹	M. E. Knapp, M.D.	Miss Ruby Green	c	12 mos.	June	24	\$200 ³	Certificate
Barnes Hospital, St. Louis.....	F. H. Ewerhardt, M.D.	Miss Beatrice F. Schulz	a-b-c	9 mos.	Oct	12	\$200	Certificate
St. Louis University School of Nursing, St. Louis ¹	A. J. Kotkis, M.D.	Sister Mary Imelda	a ²	10 mos.	Jan-Sept	12	\$250 yr.	Cert. or Degree
Columbia University, College of Physicians and Surgeons, New York City ¹	William B. Snow, M.D.	Miss Josephine L. Rathbone	a-c ¹	2 yrs.	Sept	35	\$400 yr.	Cert. or Degree
New York University School of Education New York City ¹	George G. Deaver, M.D.	Miss Elizabeth C. Addoms	a-b-c	9½ mos.	Sept	40	\$525	Cert. & Degree
Duke Hospital, Durham N. C. ¹	Lenox D. Baker, M.D.	Miss Helen Kaiser	a-b-d	12 mos.	Oct	12	\$300	Certificate
D. T. Watson School of Physiotherapy, Leedsdale, Pa. ¹	Jessie Wright, M.D.	Miss Kathryn Kelley	a-b-d	12 mos.	Oct	30	\$200	Dipl. or Degree
Graduate Hosp. of the Univ. of Pennsylvania, Phila. ¹	G. M. Piersol, M.D.	Miss K. Sutherland	a-b-c	12 mos.	Sept	20	\$200	Certificate
University of Texas School of Medicine, Galveston ¹	G. W. N. Eggers, M.D.	Miss Ruby Decker	a-b-d ³	12 mos. [†]	Jan	6	\$141 ³	Certificate
Baruch Center of Physical Medicine of the Medical College of Virginia, Richmond, in affiliation with Richmond Professional Institute ¹	F. A. Hellebrandt, M.D.	J. J. Buchanan, M.D.	a-b-c ²	12 mos. [†]	Sept	20	\$200 ³	Cert. or Degree
University of Wisconsin Medical School, Madison ¹	Elizabeth Grimm, M.D.	Miss Margaret A. Kohli	a-b-c ²	12 mos.	Sept	20	\$ 90 ³	Cert. or Degree

* Courses are so arranged that any of the entrance requirements will qualify students for training. a = Graduation from accredited school or nursing; b = Graduation from accredited school of physical education; c = Two years of college with science courses; d = Three years of college with science courses; e = Four years of college with science courses; H. S. = High school graduation; f = degree in physical education or sciences.

† Currently eighteen Navy nurses are enrolled in a six-month emergency course.

1. Male students admitted.

2. High school graduates admitted to four-year course leading to degree.

3. Non-residents charged additional fee.

4. High school graduates admitted to four-year course leading to degree from Tufts College.

5. Tuition for degree course is \$400 per year.

6. College graduates admitted to twelve-month certificate course.

7. Effective 1947 class.

8. Effective 1948 class.

† Reprinted in part J. A. M. A. 130:1156 (April 20) 1948.

** At the end of nine months the students can register in the graduate school for a degree of master of science in Physical Therapy.

APPROVED SCHOOLS FOR OCCUPATIONAL THERAPY TECHNICIANS * Council on Medical Education and Hospitals of the American Medical Association

NOTE: The duration of the course is expressed in academic years and in most schools the accelerated curriculum is being followed.

Name and Location of School	College Affiliation	Duration of Course	Classes Start	Entrance Requirements	Tuition Per Year	Certificate, Diploma, Degree	Graduates in 1945
University of Southern California, 3551 University Ave., Los Angeles	University of Southern California	2 yrs.	Sept	Degree	\$330	Certificate	8
Mills College, Oakland, Calif.	Mills College	5 yrs.	FebSept	High sch.	\$330	Cert.&B.S.	4
		3 yrs.	FebSept	Degree	\$200	Certificate	1
		5 yrs.	FebSept	High sch.	\$450	Cert.&Deg.	
San Jose State College, San Jose, Calif.	San Jose State College	3 yrs.	JanOct	1 yr. coll.	\$ 21	Certificate	
		5 yrs.	Varies	High sch.	\$ 21	Degree	
University of Illinois College of Medicine, 1853 W. Polk St., Chicago	University of Illinois	4½ yrs.	Varies	High sch.	\$ 80	B.S.	None
University of Kansas, Lawrence	University of Kansas	2 yrs.	FebSept	Degree	\$ 50	Certificate	1
		4 yrs.	FebSept	High sch.	\$ 50	B.S.	
Boston School of Occupational Therapy, 7 Harcourt St., Boston	Tufts College	2 yrs.	Sept	Degree	\$400	Diploma	41
		3 yrs.	Sept	1 yr. coll.	\$400	Diploma	
		5 yrs.	Sept	High sch.	\$400	Dipl.&B.S.	
Kalamazoo School of Occupational Therapy, Western Michigan College of Education, Kalamazoo	Western Michigan College of Education	2 yrs.	July	Degree	\$ 51	Certificate	20
		4 yrs.	FebSept	1 yr. coll.	\$ 95	Cert.&Deg.	
Michigan State Normal College, Ypsilanti	Michigan State Normal College and Univ. of Michigan	5 yrs.	Varies	High sch.	\$ 67	Cert.&Deg.	8
St. Louis School of Occupational and Recreational Therapy, 4567 Scott Ave., St. Louis	Washington University	3 yrs.	Sept	2 yrs. coll.	\$350	B.S.	13
University of New Hampshire, Durham	Univ. of New Hampshire	5 yrs.	Sept	High sch.	\$160	Cert.&Deg.	5
Columbia University College of Physicians and Surgeons, 630 W. 168th St., New York City	Columbia University	2 yrs.	Sept	Degree	\$450	Certificate	18
		3 yrs.	Sept	2 yrs. coll.	\$450	B.S.	
New York University School of Education, 100 Washington Sq. E., New York City	New York University	4½ yrs.	Quarterly	High sch.	\$450	Cert.&Deg.	13
Ohio State University, Columbus	Ohio State University	4½ yrs.	Quarterly	High sch.	\$ 80	B.S.	11
Philadelphia School of Occupational Therapy, 419 S. 19th St., Philadelphia	University of Pennsylvania	2 yrs.	Sept	Degree	\$400	Diploma	45
Richmond Professional Institute, 901 W. Franklin St., Richmond, Va.	College of William and Mary	3 yrs.	Sept	1 yr. coll.	\$400	Diploma	
		5 yrs.	Varies	High sch.	\$400	Dipl.&B.S.	
Milwaukee-Downer College, Dept. of Occupational Therapy, 2512 E. Hartford, Milwaukee	Milwaukee-Downer College	2½ yrs.	Sept	Degree	\$200	Certificate	4
		3 yrs.	Sept	1 yr. coll.	\$200	Diploma	
Mount Mary College, 2900 Menomonee River Dr., Milwaukee	Mount Mary College	3 yrs.	Sept	1 yr. coll.	\$250	Diploma	15
		5 yrs.	Sept	High sch.	\$250	Dipl.&B.S.	
University of Toronto, Dept. of University Extension, Toronto, Ont., Canada	University of Toronto	5 yrs.	Sept	High sch.	\$210	B.S.	7
		3 yrs.	Sept	1 yr. coll.	\$175	Diploma	40

The Treatment of
**SCLERODERMA AND
 VASOSPASTIC CONDITIONS OF
 THE EXTREMITIES, INCLUDING
 RAYNAUD'S DISEASE AND
 CHRONIC ULCER**



THIS 16 MM. SILENT KODACHROME MOTION PICTURE (running time, 15 minutes), shows the technic of administering Mecholyl Chloride by the method of ion transfer (iontophoresis) and the results of treatment in chronic ulcer and scleroderma. The film will be loaned to interested physicians on request. Applications for loan will be filled as quickly as prints of the film are available. Please enter your request as far in advance as possible.

*Address communications
 regarding film to
 Merck & Co., Inc.
 Dept. RA,
 Rahway, N. J.*

Mecholyl Chloride has been accepted by the Council on Pharmacy and Chemistry. Its administration by ion transfer (iontophoresis) was found to increase blood flow five times in the forearm skin and six and one-half times in the leg skin.



MERCK & CO., Inc. *Manufacturing Chemists* RAHWAY, N. J.

MECHOLYL
CHLORIDE

REG. U. S. PAT. OFF.

ACETYL-BETA-METHYLCHOLINE
CHLORIDE MERCK

An effective
parasympathetic
stimulant

COUNCIL
ON
PHARMACY
&
CHEMISTRY
ACCEPTED